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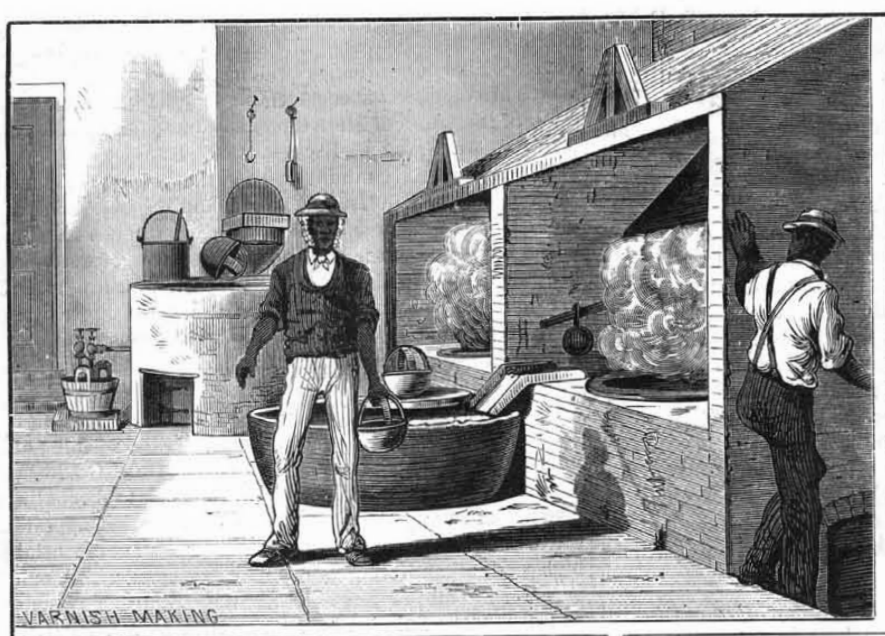

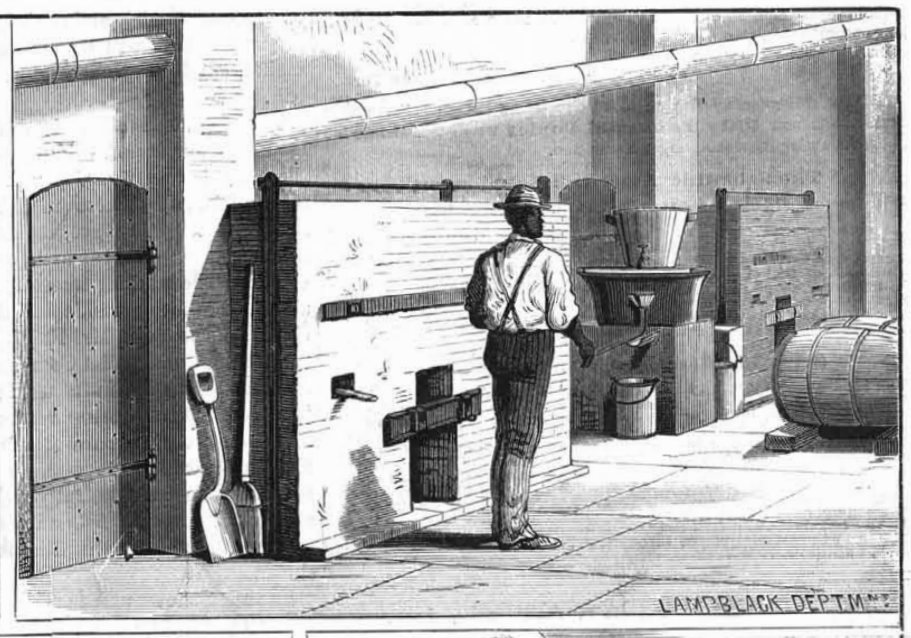

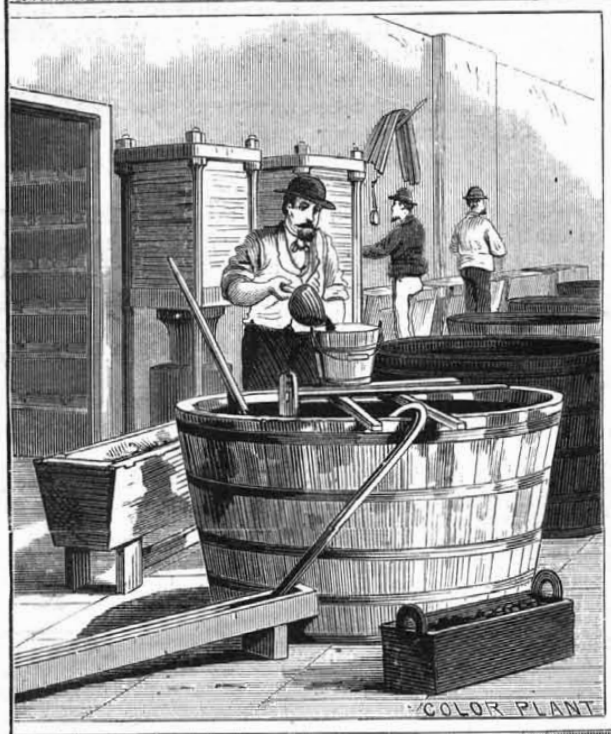

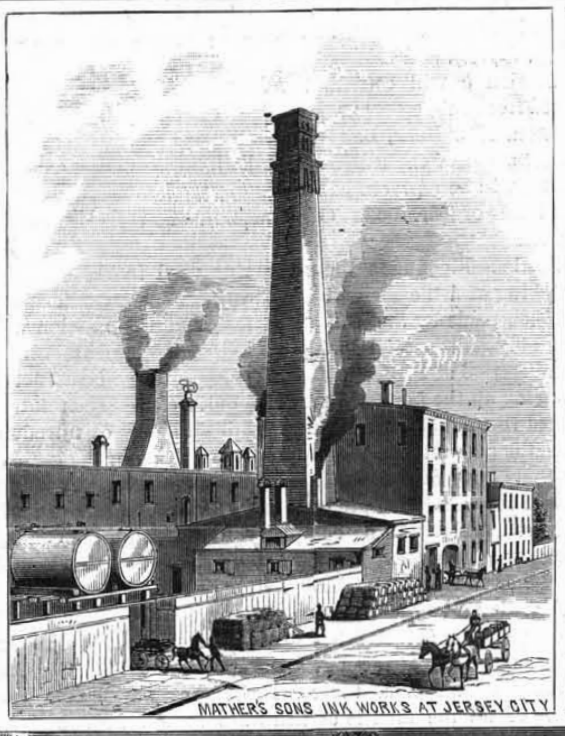

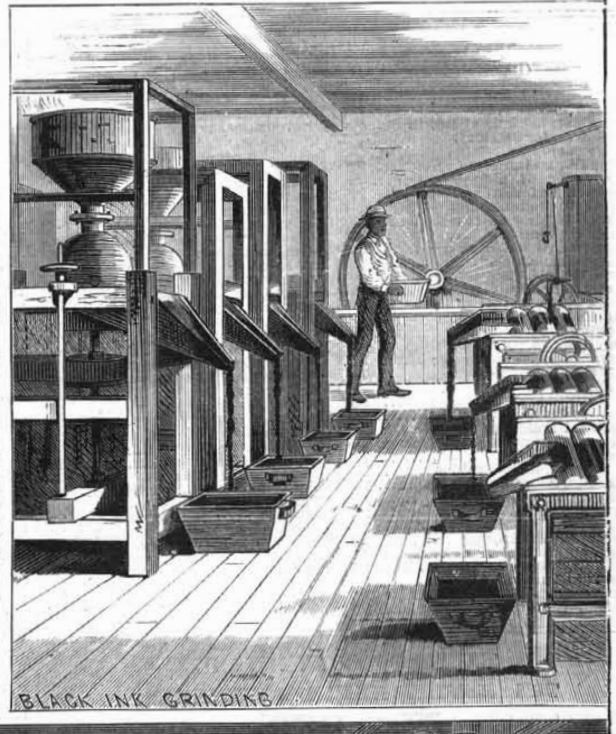

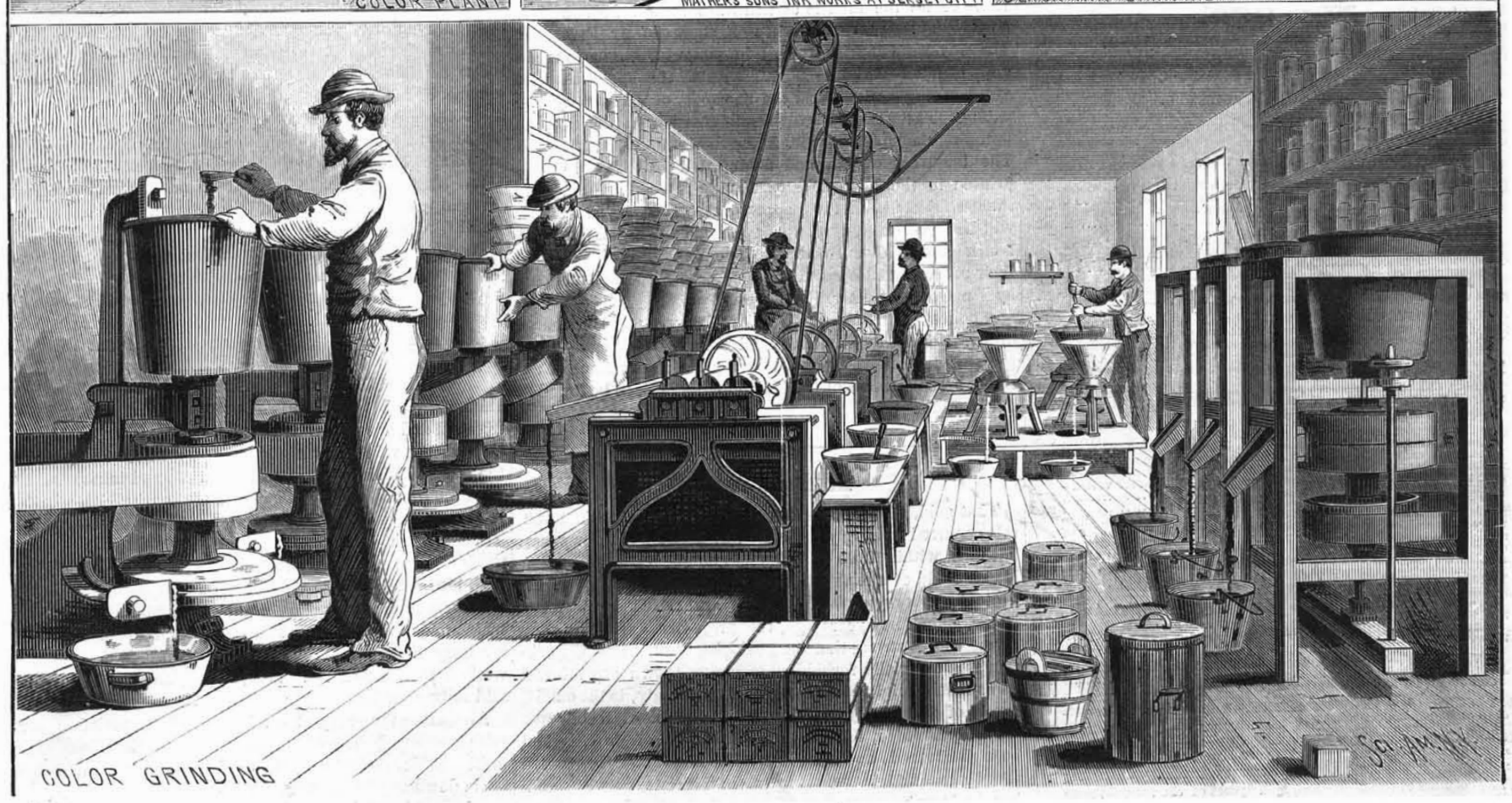

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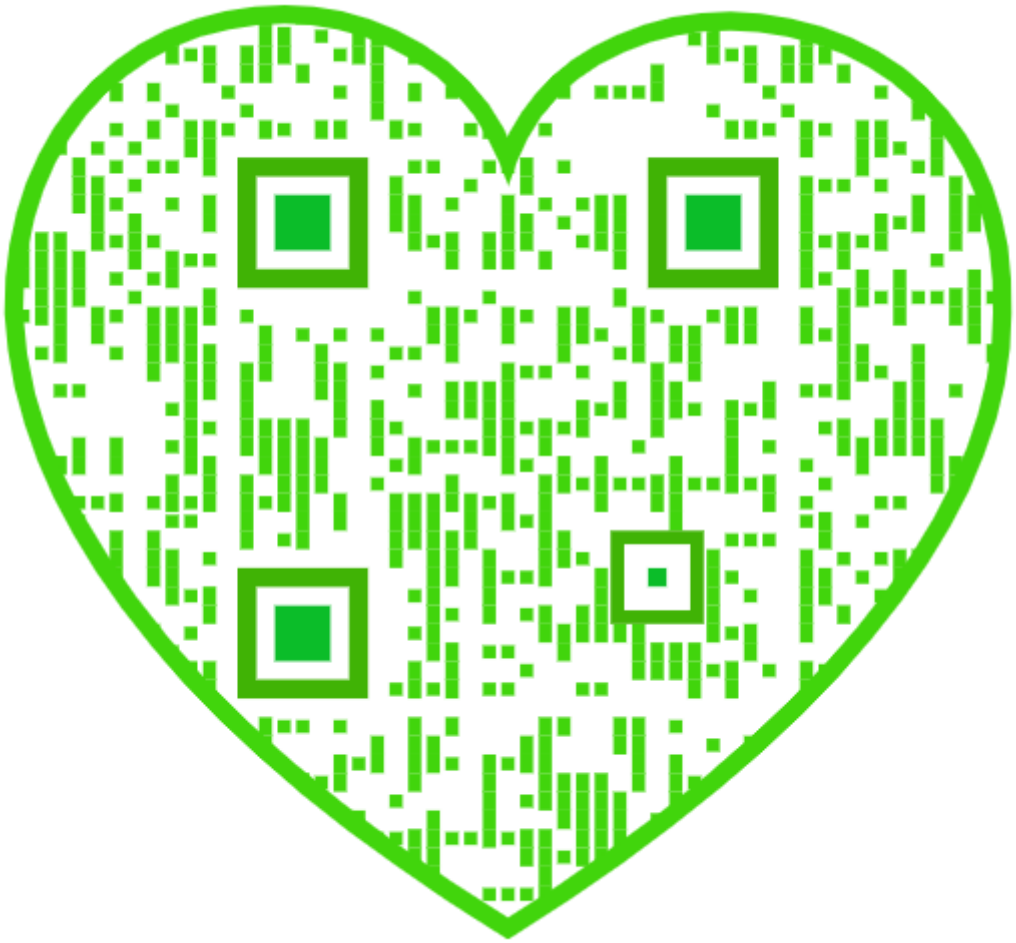

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NEW YORK, SATURDAY, APRIL 10, 1880.

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AMERICAN EXHIBITS AT THE BERLIN FISH SHOW.

The Commission to represent the United States at the International Fish Exhibition, to open in Berlin, April 20, sailed from this port March 20. At the head of the Commission is Professor G. Brown Goode, curator of the National Museum. His assistants are Mr. Frederick Mather, in charge of the apparatus used in fish culture; Mr. T. W. True, assistant in natural history; Mr. E G Rockwell, secretary; Captain J. W. Collins, of Gloucester, Mass, expert in sea fisheries; and Mr. J. Palmer, taxidermist.

The exhibits carried out by the Neckar comprised fully 7,500 specimens, having an aggregate bulk of 175 tons. They will be arranged as follows: Section 1 will contain casts, photographs, and alcoholic specimens of North America. Edible and useful fish, oysters, clams, mussels, etc., with crustaceous turtles, and the algæ. Animals and birds which prey upon fish will be shown in this section; also water snakes, edible frogs, and gulls, and other creatures used for bait.

The second section is devoted to plans, charts, and models of our coast fishing grounds, with relief models of the Atlantic coast to a depth of 200 fathoms, as far north as Newfoundland. These models were made by Mr. C. Lindenkohl. The geographical distribution of our food fishes, oysters, etc., is shown on maps devised by Professor Goode. The whaling interest will be similarly represented; also the sealing grounds off the Alaska coast, the latter charts, the work of Mr. H. W. Elliott, being exhibited by the Alaska Commercial Company. In the third section will fall the various apparatus used in fishing, a number of leading manufacturers being represented by their best work. Fish preserving apparatus will be shown in this section, also models of all the styles of boats used by fishermen, some forty in number, fully rigged, folding boats, canvas, etc. Six figures in fishermen's costumes and the various articles employed in the fisherman's personal outfit will be shown.

Section 4 shows plans and models of factories which turn out fish products, such as guano, oils, glues, gelatine, and the edible preparations, as shown in oyster packing, canning, drying, and salting.

Section 5 will contain the innumerable substances derived from fish, either used for food or employed in the arts. Boston, New York, Baltimore, and San Francisco have sent assortments of canned goods, and all our leading manufacturers will be represented. There are not less than 150 different kinds of fish food. Of American oils there are 60 varieties.

Section 6 contains the apparatus used in the artificial hatching of fish eggs and in rearing young fish. The exhibition made by the United States Fish Commission will probably gain especial distinction in this department. Under the direction of Professor Baird, a map has been constructed showing all the points where fish culture has been introduced throughout the country, with the dates of introduction, the amount of money appropriated either by the general or State government—in short, a chart showing at a single glance the wonderful progress and success of American fish culture. There will be comprised in this exhibit models of the new government floating hatchery, the Sea Hawk, and of the Druid Hill Hatching house in Baltimore.

A great variety of American fish eggs will be shown, and when possible, actual fish culture will be carried on. In addition to this, at the particular request of the German Fishery Commission, there will be sent out a complete series of all the models of fish-ways in use in American rivers. This department will be in charge of Mr. F. Mather. The Government will exhibit in section 7 the various devices of the Lighthouse Board, with all the apparatus used at life-saving stations, and the methods of cautionary signaling. The Coast Survey sends charts, and the deep sea sounding machinery of Mr. A Agassiz and Captain Sigsbee. The literature of fish and fishing, with all the journals printed in the United States having special reference to these subjects, find their appropriate place. The fine arts will be represented by pictures painted by Mr. S. A. Kilbourne and Walter Brackett. The Messrs. Scribner send their profusely illustrated "The Game Fish of America," by Mr Goode and Mr Kilbourne.

A collection of terrapins and live fish were sent in charge of Mr. Mather, by Mr. E. G. Blackford, of this city, who proposes to send every week, during the continuance of the show, an assortment of the leading edible fish to be found in our markets.

MINING IN MAINE.

That gold, silver, copper, lead, and other valuable minerals occurred sparingly in Maine has been known for years; but until within three or four years no one has believed that Maine could ever rank among the mining States. When the geological survey of the State was authorized by the legislature, some forty years ago, the prejudice against mining fevers was so strong that the geologist, Prof. Chas. T. Jackson, was especially forbidden to make known any mineral veins that he might come across. Accordingly, in the official report of the survey, allusion to the precious metals was carefully avoided, though several deposits of promise had been discovered; and since then it has been taken for granted that there were no precious metals in the State, notwithstanding the large number of specimens of silver and copper ores shown in the State cabinet of minerals at Augusta.

During recent years, however, a great many natives of the State have returned from the mining regions of the far West, where they had gained a practical knowledge of mines and minerals; and looking with educated eyes upon the rocks of their native hills they could not mistake the numerous indications of mineral deposits, similar to those they had become acquainted with in California. As soon as one or two mines had given proof of actual bodies of valuable ore within the State the search for paying leads became general. In 1878 nine or ten mining companies were organized and incorporated; during the next twelve months the number was increased to fifty. The Maine mining directory now contains the names of sixty-three incorporated companies and thirty-four private companies, chiefly devoted to silver mining. If a tenth part of these are based on deposits of real value, and some of them certainly are, the future of Maine as a great mining State is assured. The more promising mineral discoveries have been principally along the coast, in seven belts, which are described at considerable length in the little handbook of the mines of Maine, published last fall by the State Assayer, Mr. Frank L. Bartlett.

The most easterly mining district, the Lubec belt, extends through Campobello Island, Lubec, and Trescott, and probably also to St. George, New Brunswick, where similar deposits have been opened up. The ore consists of silver-bearing galena, zinc, and copper, the proportion of lead and silver increasing downward. Fine specimens of copper pyrites have been found at Campobello Island. Though the oldest mining in the State, the Lubec belt has been but imperfectly prospected.

Further west the Gouldsboro and Sullivan mining belt has been extensively prospected, resulting in the opening of a number of promising mines. It extends from Gouldsboro through the towns of Sullivan and Hancock to Franklin, a distance of twenty miles or more. Similar veins appear in the towns of Cherryfield and Harrington, the ore being a high grade argentiferous galena with zinc blende. At Gouldsboro are several prosperous mines, the ores being abundant and rich. The Sullivan lode is regarded by Mr. Bartlett as one of the most remarkable silver-bearing veins ever discovered. At the surface it showed eight or ten inches of quartz containing silver sulphuret, galena, and iron pyrites. Native silver, in threads and flakes, was obtained at a depth of eight or ten feet. Deeper the predominating ore is a black sulphuret of silver, with specimens of native silver, and a great variety of other silver ores. The proportion of lead is small; there is considerable iron, some arsenic, and a little zinc. A large number of discoveries of ores have been made in the neighborhood of Sullivan and across the river on the Hancock side, and several important mines are being developed. Among the more promising localities are Mount Desert, Hancock Neck, Iron Bound Island, Little Duck Island, and Petit Manan Point.

West of the Sullivan belt, twenty-two miles, is the Blue Hill copper belt, at the head of Blue Hill Bay, in Hancock County. This copper belt is about four miles long by half a mile wide. It resembles the copper belts of Falun, Sweden, the Carpathian belts, and the Chilian deposits. There are six regularly organized companies at work here. A silver mine has been opened at one end of the belt, and ores of manganese and antimony are found in several localities.

Further south, at Byard's Point, in the town of Sedgwick, several silver-bearing veins, one quite large, are being worked. In one place, at a depth of sixty-five feet, native silver was found, the ore possessing many characteristics of the Sullivan ore. On Deer Isle, opposite Byard's Point, a number of promising silver veins are being worked; and other neighboring islands appear to be rich in ores. A large deposit of nickel ore has been found at Vinal Haven.

In the great metalliferous slate belt of Penobscot and Piscataquis counties—70 miles wide by 120 miles long—several mines of copper are being worked, and large bowlders of silver-bearing galena have been found in various places. Several galena mines are in operation in Dexter, Corinna, and St. Albans.

Another narrow but very promising mineral belt is being developed in Acton and Lebanon, York County. The ores consist mainly of argentiferous galenas, with zinc, arsenical iron, and copper. In some places are oxides and carbonates of lead rich in silver. This region has been but little explored.

The Wakefield and Parsonsfield belt crosses into New Hampshire. It is eminently a quartz and gneissic belt, carrying gold and argentiferous galenas. Recent reports tell of an immense vein of auriferous quartz near the State line, in the town of Wakefield. Gold, in quartz and in river sands, has been found in many other parts of the State, but whether in quantities sufficient to pay for mining remains to be seen. Tin has been found in many localities, and may occur in profitable quantities. Zinc ores are abundant, associated with lead, and will probably be profitable as a by-product. There are immense deposits of arsenical iron in the State, which may be made to yield arsenic in abundance. There is a large deposit of antimony at Vanceboro, which has been worked to some extent. Iron, nickel, and cobalt are also said to be abundant.

Altogether the prospect is fair that, after a period of feverish activity, during which much capital is likely to be sunk in ill-considered ventures, the mining interests of Maine will settle down to permanent and profitable work in a sufficient number of localities to give the State an honorable rank among the great mining districts of the world.

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THE OLD RIVER BEDS OF CALIFORNIA.

In the current number of the *American Journal of Science and Arts*, Professor Joseph Le Conte discusses the subject of the old river beds of California, which, in several respects, present features that are entirely unique. In most countries, as, for example, in Europe and the Eastern United States, the new or present river beds occupy the same position as the old; while in Middle California the rivers have been *displaced* by lava flows from their former position and compelled to cut entirely new channels.

Again, in certain portions of Europe and the Eastern United States, the old river beds are broad, deep troughs, filled sometimes several hundred feet deep with detritus, into the upper parts of which the present much-shrunken streams are cutting their narrower channels on a *higher* level; while in California the displaced rivers have cut their new channels 2,000 to 3,000 feet deep in solid slate, leaving the old detritus-filled channels far up on the dividing ridges. In the Northeastern United States the drainage system has remained substantially unchanged since early tertiary, or even earlier times; while in Middle California the tertiary drainage system seems to have been obliterated, and the streams have been compelled to carve out new and independent drainage systems, to a much deeper level and having the same general direction, but often cutting across the former. Furthermore, in California, the detritus which fills the old river beds is nearly always capped with lava, clearly indicating the cause of the displacement. Finally, the contrast is further marked in the fact that the detritus filling of the old California river beds usually consists of large pebbles and bowlders; while the old channels of the Eastern coast are filled with fine silt.

This peculiar relation of the old to the new river beds does not characterize the whole Pacific slope, but only the auriferous slate belt of Middle California. It is not found in the coast range, nor in the region of the granite axis of the Sierra range. Neither is it found in any marked degree in extreme Northern California, nor in Oregon, nor in Southern California. It seems to be confined mainly to the slate belt of the western slope of the Sierra from Plumas county on the north to Tuolumne county on the south, inclusive, a distance of about 250 miles, and from the San Joaquin and Sacramento plains on the west to about 4,000 feet elevation on the Sierra slope on the east, a breadth of about 35 miles.

There are many difficult and important questions suggested by these phenomena. How were the old river beds filled with detritus? How were the streams displaced? Why have the new channels been cut so much deeper than the old? When did these events occur?

In answer to the first question, Professor Le Conte first points out the fact that rivers either erode or build up by deposit. Every current has a certain amount of energy, and can do a certain amount of work, increasing with the velocity. This energy is divided between the work of transportation and that of erosion. If the load of transported matter be moderate, a large amount of energy is left for erosion; but if it be very great, the whole energy may be expended in transportation and none left for erosion—the limit is reached at which erosion ceases and deposit begins. All that is necessary, therefore, to cause any stream to deposit, is to increase its load beyond the limits of its energy. If rivers build, they almost always do so very rapidly. Now, the phenomena of the old river gravels are precisely those of deposits made by the turbulent action of very swift, shifting, overloaded currents, which must have been far swifter and more heavily loaded than any existing ones. Therefore the process of filling must have been exceptionally rapid. It may have occupied years, or even centuries; but, geologically, it must have been a very speedy process. And these conditions must have been fulfilled by the rapid melting of extensive fields of ice or snow. The reason the detritus was not carried away again was because immediately after the filling the detritus was protected and the rivers displaced by the lava flood. This brings us to the cause of the displacement of the rivers.

Middle California lies on the southern skirt of the great lava flood of the Northwest. The center of the great outflow (which came from fissures and not from craters) was the Cascade and the Blue Mountains. In Oregon the lava is 3,000 feet thick; in extreme Northern California it is still several hundred feet thick, and the old river beds are hopelessly concealed. In Middle California it is reduced by erosion to ridges and patches. Immediately after the obliteration of the previous drainage system, the rivers began cutting a new system having the same general trend (determined, of course, by the mountain slope), but independent of, and therefore often cutting across the older system. From all the facts of the case the conclusion seems inevitable, that the subterranean heat of the impending lava flow was the cause of the rapid melting of the snow and ice, and the consequent rush of the overloaded waters, which filled the channels with detritus. Before the melting was completed the ash eruptions had already commenced, and mud streams, followed by lava streams, completed the work of obliteration.

It is almost certain that, coincident with the outflow of lava in California, there was an increase in the elevation of the Sierra range. The inevitable effect of this would be the cutting of new channels below the level of the old, and thus, finally, the singular relation between the old and the new channels which now exist. Professor Le Conte believes that these general phenomena of the gravels and their accumulation are wholly those of the Quaternary period. They can hardly be explained except by the existence of glacial conditions. Also the gentle movement of elevation which he supposes to have preceded and attended the lava flow is characteristic of the Quaternary everywhere. On the other hand, it is certain that the Pliocene passed insensibly into the glacial epoch, and therefore that glacial conditions commenced in the Pliocene. Furthermore, it is certain that here in California, glacial conditions continued and reached their acme *after the lava flow;* for glaciers occupied all the present cañons, and *swept away all the lavas* from the granite axial region, exposing their roots in the form of dikes. In conclusion, therefore, it seems best to make both the accumulation of the gravels and the lava flow which protected them the dividing line between the Pliocene and Quaternary, although it is probable that glacial conditions had already commenced when these events occurred.

ARIZONA SHELLAC.

At a recent meeting of the California Academy of Sciences Professor Stillman read a paper on the gum and coloring matter found on the *Acacia Greggii* and the *Larrea Mexicana* or creosote plant. The gum which exudes from these plants is very abundant, and is the product known to commerce as shellac. The same plants produce lac dye. Professor Stillman suggested that California might compete with British India in supplying this valuable product. Mr. B. B. Redding said that these lac-yielding plants were as plentiful as sage-brush from Southern Utah to New Mexico, and from the Colorado Desert to Western Texas.

The lac is most abundant around stations on the Mojave and Colorado deserts, and exudes as the result of an insect's sting. Calcutta exports a million pounds sterling in value annually of shellac, selling at 25 to 35 cents a pound, and almost as much more of lac dye, selling at 30 to 40 cents a pound. In 1876 the United States imported 700,000 pounds of shellac alone. To collect this is simple work for boys, and will prove an important industry. It will require little or no capital. The twigs are boiled in hot water, and the gum rises to the top, is skimmed off, strained and dried on smooth stones, and hand pressed into flakes, ready to make sealing wax or varnish. The residue, when allowed to settle, makes lac dye. The plants live on a rainfall of three inches a year.

In vol. vi. (Botany) of the Reports of the U. S. Geographical Surveys west of the 100th meridian we find the following information relative to these two plants, which would seem to be worthy the attention of commercial men and manufacturers:

P. 108—ACACIA GREGGII, Gray.—A small tree, 10 to 20 feet high, pubescent or glabrous, unarmed or with scattered stout recurved prickles; pinnæ 2 or 3 pairs, on a slender petiole; leaflets 4 or 5 pairs, oblong or oblong-ovate, 2 or 3 lines long, rounded or truncate above, narrower at base, rather thick, and with 2 or 3 straight nerves; flowers in cylindrical spikes an inch or two long, the peduncles equaling or exceeding the leaves; pods thin, coriaceous, flat, 3 or or 4 inches long by 5 to 7 lines broad, shortly stipulate, acute, curved, glabrous, and reticulated, more or less constricted between the seeds; seeds half an inch long.—From Western Texas to Southern California; collected in Western Arizona, 1872.

P. 41—LARREA MEXICANA, Moricand, *Creosote bush.*—Common from Western Texas to Kern County, California, and southward to Mexico. Dr. Loew's examination proves that the reddish-brown exudate on the branches, caused by an insect, will yield a red coloring matter showing all the reactions of cochineal. "The alcoholic extract of the leaves, on evaporation, yields a greenish-brown residue of a specific and somewhat disagreeable odor, more strongly perceptible on boiling the extract with water. This residue is only to a small extent soluble in water, and the solution has an acid reaction. It yields a light yellow precipitate with acetate of lead. The part of the alcoholic extract that is insoluble in water is easily soluble in alkalies. It also dissolves in nitric acid at a moderate heat, whereby oxidation takes place. On addition of water a yellow brittle mass is precipitated." The Mexicans are said to use an infusion of the leaves for bathing in with good effect in rheumatic affections. (Also vol. iii., Wheeler's Reports.)

P. 80—LARREA MEXICANA, Moric (*L. glutinosa*, Engelmann), Valley of the Gila, Arizona.—This shrub is especially common on the hills bordering the Gila, also on the sandy wastes adjacent to Tucson and Camp Lowell, in Arizona, even imparting its strong odor to the air.

In the third volume of these reports this plant is also called stinkweed and etiontio.

The Non-examination of Engineers in Chicago.

Chicago is waking up to the necessity of regulating the employment of engineers and the establishment of a system of official boiler inspection. The *Inter-Ocean* says:

"There seems to be an impression that any one, after a few hours' instruction, can run a stationary engine and boiler, or boilers, and the result is that the man or boy who will work cheapest gets the place. Most of the engines in the business and office blocks in the city are in charge of old feeble men or mere boys, and there are actually cases where women do the work. Many of the large factories, rolling mills, blast furnaces, foundries, grain elevators, implement and machine shops have men in charge of the engines, but how competent these men are as engineers there is no means of learning, and boy engineers are to be found even in some of these great establishments. In some places, too, the engineer does not put in his whole time about the engine and boiler, but is called out by the foreman every now and then to do other work, and engine and boiler have to take care of themselves for long periods."

The natural consequence of this sort of carelessness is a frequency of explosions, with loss of life and limb, that is positively alarming. Chicago has no city inspectors of boilers, the only inspections being by the insurance companies where they have risks.

ANOTHER SIX WEEKS OF SUSPENSE.

Five drops of water for the sawing of ten cords of wood is a liberal allowance compared with the originally promised propulsion of steamships across the Atlantic with a pint or so; still it will be an achievement worth recording when it comes off "about six weeks from now." That is the way with Mr. Keely; his marvelous motor is always on the point of being completed, but the finishing touch is always delayed. It is gratifying, however, to know just how the matter stands, and for this information the world is indebted to a correspondent of the New York *Times* who has lately been favored with a "private exhibition" at Mr. Keely's workshop in Philadelphia. The correspondent says of the new engine:

"All the machinery is contained in a cylinder which resembles an ordinary drum. Through this runs a double shaft, one revolving in a sleeve. It is upon this shaft that the difficulty at present exists. The negative and positive motions are nearly equal, and Mr. Keely is engaged in the graduation of these so as to cause them to harmonize. When he accomplishes this, which he says is a tedious operation, then the Keeley motor will be completed."

The *Times* correspondent has seen the machine turn an 18-inch wheel with force enough to break a rope, but he does not say what fraction of a drop of water sufficed to generate the exhibited power. The new generator is pronounced a curiosity. It occupies a space about six feet by ten feet, with a height of five feet.

"There are numerous small pipes, of mysterious appearance, of the thickness of telegraph wire, bored to the fineness of a cambric needle. One of these leads from the generator to the engine, and it is claimed that all the power is secured through this medium, and the regularity of motion secured by the vibratory apparatus contained inside the drum cylinder. People who expect to learn all about the engine, generator, and the secrets of the thing, will probably be discouraged when they take into their mind what Mr. Keely says. "After I have secured my letters patent, it will require at least a year of lecturing to demonstrate the secret of this generator and engine," remarked Mr. Keely. "The apparatus will be in use some twenty years before the thing is fully understood."

The public exhibition of wood-sawing is promised "somewhere about July 1," year not stated. The *Times* correspondent does not say whether he or his friends have any stock to dispose of, or what ground there is for believing that the tedious harmonizing process above mentioned will ever be accomplished. Mr. Keely's facility in the invention of plausible excuses and catch phrases for the gulling of the simple is scarcely less remarkable than the capacity of some people to be gulled.

The East River Bridge.

The New York approach to the East River Bridge is finished with the exception of about four blocks, and the property through to Chatham street has been appraised by the bridge authorities. Should this not be accepted by the owners, a commission, acting under the railroad law, will be appointed to value the land. Upon this portion of the work 90,000 bricks are being laid daily. But one block of the Brooklyn approach remains unfinished. The cities still hold about $1,000,000 of interest accruing from the sale of bonds. The first one hundred tons of the recently awarded contract for steel have been sent from the Cambria Iron Company at Midvale to be rolled; from there they will be taken to the Edgemoor Iron Company, who do the drilling, fitting, etc. The bill for the final appropriation—$2,250,000—now pending in the Legislature, has passed the Senate, with an amendment, and is in the House, where it is favorably received.—*Engineering News.*

International Exhibition of Steam Thrashing Machines.

The Italian Minister of Agriculture, Industry, and Commerce has arranged to hold an international exhibition of steam thrashing machinery at Perugia, in Umbria, Italy, to begin July 1, 1880. Only machines from one to four-horse power will be admitted. Four prizes of gold, silver, and bronze will be bestowed by the government. Public tests of the competing machines will be made under the direction of a commission. Applications must be made before May 31st next, to Signor Alessandro Raspi, Secretary of the Agrarian Committee, Perugia, who will furnish any desired information with reference to the competition.

THE enormous advance in the cost of paper may be in part attributed to its extensive use in the various arts and manufactures not connected with printing. The last application of paper is the construction of an astronomical tower twenty-nine feet in diameter at the Polytechnic Institute, Troy, N. Y.

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A Prevalent Popular Error.

By the burning of a Chinese wash house in San Francisco a short time since, eleven of the occupants who were asleep in bed lost their lives. The account published in the newspapers described them as exhibiting, by the positions in which their bodies were found, the agony they suffered from the fire. As editors and reporters are considered to possess more than an average amount of intelligence and information, it appears singular that they should propagate or perpetuate such an error. It may be safely asserted as a general rule that persons who lose their lives while sleeping in burning buildings, are suffocated and die painlessly without waking, and before the flames had reached their bodies. The merest tyro knows what would be the effect of going to bed with a pan of burning charcoal in the room, or the effect of blowing out the gas instead of turning it off. An individual going to sleep under such circumstances inhales the impure air, which acts as an anæsthetic and rapidly converts the natural sleep into stupor and coma, from which there is no waking. Persons sleeping in a house which takes fire are smothered in this way by the carboniferous gas long before the fire reaches them. Their bodies or remains are found—not in the halls or stairways where they would have been had they awakened and attempted to escape—but in bed, or in the spot which the bed had occupied, and in the very position in which they had been lying asleep. The exceptions are mostly noticeable, as when persons are seen to make attempts to escape. There is something so horrible in the idea of being burned to death that it were well for the community not to suffer needlessly from sympathy for the victims. To the relatives of persons who lose their lives in burning houses, particularly to parents whose children may die in this way, it may save a lifetime of grief to know that death entered the chamber quietly and performed his task without so much as disturbing the slumbers of his victim.—*Pacific Med. and Surg. Journal.*

NEW USES FOR OLD TIN CANS.

BY A. W. ROBERTS.

I give below the result of an extended experience in the utilization of tin cans, such as are used by the million by

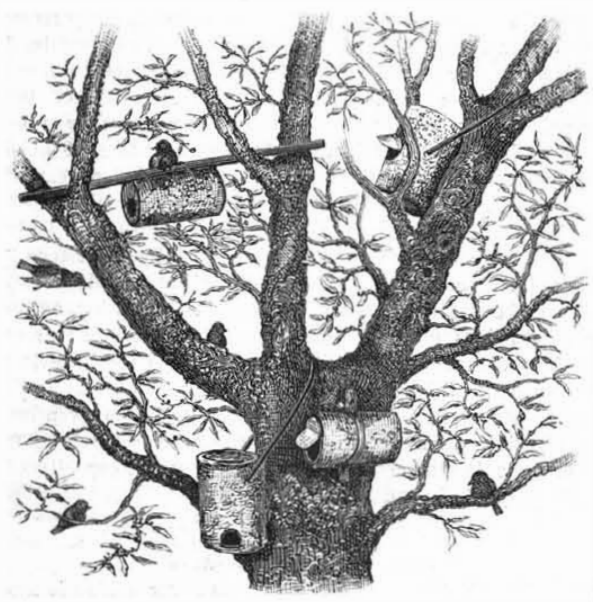

Fig. 1.—Bird-houses made from Old Cans.

packers of fruits and other articles. These cans, after serving their original purpose, are usually thrown into obscure corners, battered and rusty, a nuisance to every one.

By the method given below these troublesome articles are made useful and even ornamental, such articles as flower-pots, hanging baskets, bird-houses, etc., being produced from them with little trouble or expense.

The cans were prepared in the following manner: Procuring a large dishpan, as much asphalt was melted in it as it would hold with safety. Into the boiling asphalt the cans were dipped; as each can was taken out it was rolled in dry sand, to give it a natural ground color; without the sand the effect of the black asphalt coating would be somber and out of keeping with the color of the surroundings. To give some of these bird-houses a still more picturesque effect they were rolled in the ordinary dry packing moss used by florists and wood mosses; also short dry twigs, small cones, and burrs were fastened on the cans. In this way very nice effects of color were produced. It is a well known fact that birds avoid brilliant or artificial colors; for this reason greens, grays, browns, and neutral tints are best for bird-houses. Where cans had been opened so that the top piece was still attached by a small piece of metal, it was bent down so as to form a rest for the birds when feeding their young, or a porch or rain screen over the entrance. All these little points when carried out gave character, variety of form, and completeness. The different ways of fastening and suspending the bird-houses are shown in Fig. 1. I sometimes fastened branches of vines over the birdhouses to more thoroughly obscure them.

A glue-pot, a grater, a fruit gatherer, and a bailer, shown respectively in Figs. 2, 3, 4, and 5. The glue-pot, Fig. 2, was made in the following manner: Selecting an empty two pound can, enough tin was cut away to admit of an empty one pound can. This inner can projected one inch above the top of the one pound can, and was held in position by four wooden pegs, which were slightly tapering, so as to bind. Holes were made in the shoulders of the cans, through which wire bails were fastened.

Fig. 3, a bread grater, is so simple that it hardly needs

Fig. 2.—Glue Pot.

Fig. 3.—Bread Grater.

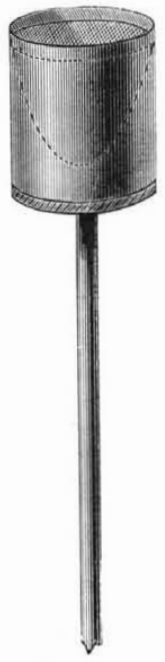

Fig 4.—Fruit Gatherer.

describing. Out of a piece of one inch board a holder was shaped on which a perforated piece of tin was fastened. This piece of tin consists of a side of a fruit can flattened out. Tines were then drawn diagonally over it for guides when punching in the holes. The tin was laid on a piece of wood, in which a hole had been made of the exact depth required for the uniform projection of the burred cutters of the grater. The tin was then nailed to one side of the holder and bent over in as perfect a curve as possible to the other side, when it was again fastened.

Fig. 4, a peach gatherer, was made by attaching a circular piece of board to the end of a long pole and fastening to this a can. Inside of the can there was a bag to receive the fruit without bruising. The bag was sewn inside of the can through a circle of small perforations. The rim of the tin was sharpened, so that when pressed against the stem of the fruit it would cut through it.

Fig. 5 shows a liquid measure or a water bailer. A hole is made in a can two inches below the edge; through this hole a handle is inserted which presses against the opposite side and is secured with a nail or screw.

Fig. 6 represents a fruit can converted into a respectable looking flower-pot. The can to be operated on was first dipped in the hot asphalt. A piece of well-seasoned white birch bark was cut out of the same height as the can and sufficiently long to reach around it. This piece of bark was so shaped that it flared out from the bottom of the can, leaving considerable space between the can and the bark. This space was filled in with hot asphalt. For ornamentation of the pots burrs of the liquid amber, black alder, and acorns were used. A hole must always be made in the bottom of the pots for the drainage of surplus water.

Fig. 7 is a hanging pot, planted with ferns. This was also covered with white birch bark, fastened on the straight sides of the can with asphalt. Three wires, by which it was suspended, were fastened to the rim of the can. In using cans for flower-pots or hanging baskets care should be taken to thoroughly coat the insides and outsides with the asphalt; this secures the tin from rusting.

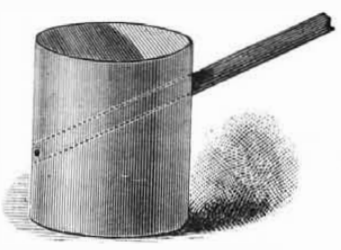

Fig. 5.—Bailer.

Fig. 8, a hanging log, was made by partially telescoping two cans together, after the opened end had been entirely removed. A section of the side of each can was cut out, to leave an opening for the reception of the soil and plants. The cans were then heavily coated with asphalt, particularly where the cans joined, so as to strengthen the joint. Barks of chestnut and oak trees were used for covering the cans.

Fig. 6.—Flower-pot.

Fig. 9 is a standard for plants and flowering bulbs. Having secured an old center-table, two cheese-boxes of different sizes were placed one on top of the other, the smaller one on top. Around the side of the lower box fruit can flower-pots were ranged, above these ranged another circle of pots, which stood on top of the largest cheese-box and against the side of the smaller one. On top of the smallest box more pots were placed, so that but little of the cheese boxes could be seen. All the pots were ornamented with burrs, cones, lichens, or barks. The spaces left between the boxes were filled in with wood mosses. Around the rim of the table was nailed hooping from a flower barrel. The inner angle formed by the hooping and the top of the table was patched with putty. Over the entire top of the table, the hooping, and the putty, hot asphalt was applied with a brush. This rendered the top of the table watertight, so that when watering the plants water could not run on to the floor. A hole bored through the top of the table afforded an escape for surplus water. The cheese boxes were coated inside and outside with asphalt, to prevent them from warping. The open space between the first circle of pots and the rim of the table was filled in with earth, on top of which moss was built up to the first circle of pots. The plants used were tradescantia, German ivy, English ivy, vincas, saxifraga, hyacinths, and calla lily.

Fig. 10 shows the complete plant standard. In hanging baskets, pots, and standards, where the plants are planted closely together and in a comparatively small bulk of soil, they require frequent watering and occasional applications of liquid manure. Our fowls provide us with a very fair article of "domestic guano," from which we make good liquid manure of sufficient strength by mixing one shovelful to a barrel of water. Still there is danger in a too generous use of liquid manure; if too strong or too frequently used the tender roots of the plants are injured and the leaves begin to fall.

Fig. 11 is a fern rockery for table or Wardian case. For the rockwork the most picturesque of rocks in form and color were selected. The rocks were fastened together with plaster of Paris, which was mixed with dry colors, grays and browns predominating. As fast as the plaster was applied sand was thrown on it. The effect of the coloring and sanding of the plaster was to destroy its whity glaring look, and to harmonize it with the general colors of the rock work. The cans used for the flower-pots were first wrapped in wet paper, to increase them in size, before applying the

Fig. 7.—Hanging Flower-pot.

plaster against them when building up the rock work. In a few hours the paper wrappings had so dried that the pots were easily withdrawn, after which the paper was removed and the pots put back in their places.

Fig. 12 is a vase for dried grasses and autumn leaves, which was constructed as follows: To the top of a broken-off lamp standard of glass was fastened a fruit can that had been previously dipped in asphalt. The outside of the can was then carefully covered with selected lichens and tufts of "sealing wax moss." Shells and parts of pine cones were used for ornamentation.

Weighing an Elephant without Scales.

An Indian writer relates an interesting anecdote concerning Shajee, the father of the first ruling prince of the Mahrattas of Hindostan, who lived at about the beginning of the seventeenth century. On one occasion a certain high official made a vow that he would distribute to the poor the weight of his own elephant in silver money; but the great difficulty that at first presented itself was the mode of ascertaining what this weight really was; and all the learned and clever men of the court seem to have endeavored in vain to construct a machine of sufficient power to weigh the elephant. At length, continues *Little Folks*, it is said that Shajee came forward, and suggested a plan, which was simple, and yet ingenious in the highest degree. He caused the unwieldy animal to be conducted along a stage, specially made for the purpose by the water-side, into a flat-bottomed boat; and then, having marked on the boat the height to which the water reached after the elephant had weighed it down, the latter was taken out, and stones substituted in sufficient quantity to load the boat to the same line. The stones were then taken to the scales, and thus, to the amazement of the court, was ascertained the true weight of the elephant.

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The Use of Asphalt and Mineral Bitumen in Engineering Works.*

Adopting the nomenclature of M. Léon Malo, which had received general sanction, the author considered asphalt as

Fig. 8.—Hanging Log.

a combination of carbonate of lime and mineral bitumen produced by natural agency. Asphaltic mastic was the rock ground to powder, and mixed with a certain proportion of bitumen. Gritted asphalt mastic was asphalt mastic to which clean sharp sand had been added. Asphaltic or bituminous concrete was gritted asphalt mastic mixed when hot with dry flint or other stone. Boussingault's analysis of bitumen gave $C_{85}H_{12}O_3$. It was, therefore, an oxygenated hydrocarburet, and quite distinct from the preparations of gas tar and pitch which were sometimes erroneously styled bitumens and asphalts. It was important that these distinctions should be borne in mind when specifying asphalte, as their disregard might lead to the employment of a material having few of the properties of the natural rock, although bearing to the uninitiated a strong resemblance thereto. Messrs. Hervé Mangon and Durand-Claye, of the Ecole des Ponts et Chaussées, Paris, had supplied the author with detailed analyses of different kinds of natural asphalts, which were given in the paper, and specimens were exhibited. But beyond knowing the numerical value of the proportionate constituents, it was highly necessary that the engineer should be acquainted with their quality.

Asphalts which gave almost identical analyses might in practice yield widely different results, if the nature of the individual components was dissimilar. Powdered limestone should be white, and soft to the touch; if rough, it probably contained iron pyrites, silicates, crystals, etc. The presence of these substances was prejudicial, and if suspected the limestone should be subjected to a secondary analysis, directions for which were given. The proportion of bitumen to limestone in the natural asphalt should not exceed 10 per cent for carriage ways; indeed, less than that was preferable. For this latter purpose no asphalt should be specified which had not stood the test of at least three hot summers and three cold winters. These precautions being taken, the author was of opinion that a well laid surface of compressed asphalt, 2 inches to 2⅝ inches thick, on a foundation of

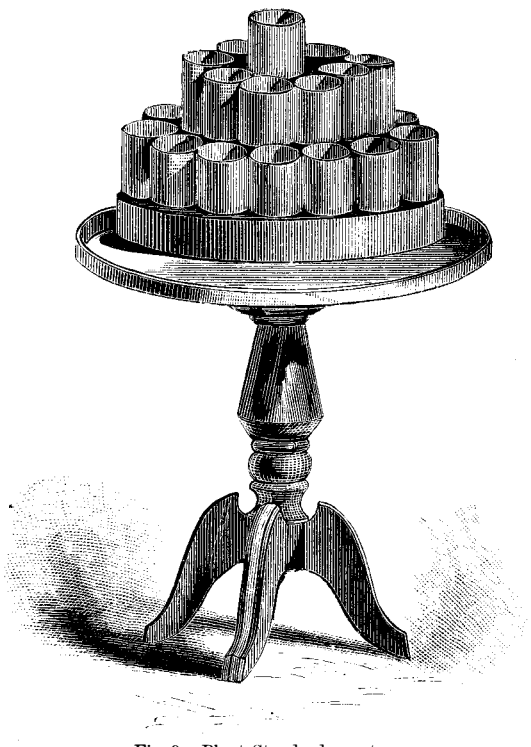

Fig. 9.—Plant Standard, empty.

Portland cement concrete, 6 inches to 9 inches thick, was superior to all other carriage ways. It was noiseless; hygienic, being impervious to urine and the liquids from dung; absorbed vibration; produced neither dust nor mud; was cheap, durable, and easily repaired, and the old materials could be used again. The charge of slipperiness which had been made against asphalt roadways in London was not due to the material, but to the absence of provisions for proper scavenging. In Paris, where the asphalt was regularly scraped, washed, and swept, the complaint did not arise. In support of the assertion that climate did not affect the asphalt in London, a table of humidity was given, showing the means of six years' (1873–8) observations to be: for Paris, 80·2; for London, 81·5. The cost of washing the roadways, when done systematically and on a large scale, was much less than was generally supposed, and the advantages far more than counterbalanced the expense. The author submitted a design for a portable washing and sweeping machine for use in London. Reference was made to the cost of compressed asphalt carriage ways. In Paris this amounted on the average to about 13*s.* per square yard on lime concrete 4 inches thick, but a thickness of 6 inches to 9 inches of Portland cement concrete was much preferable. The cost of transport of the material also exercised an important influence on the ultimate expense. Details were given of various works of asphalt paving carried out by the author, with particulars of the cost of maintenance.

The quality of absorbing vibration, which was a marked characteristic of asphalt roadways, had been taken advantage of in the application of the material for the foundations of machinery running at high speeds. This was instanced in the case of a Carr's disintegrator, which, being mounted in a pit lined with bituminous concrete, was worked at 500

Fig. 10.—Plant Standard, filled.

revolutions per minute, without sensible tremor, whereas with the former wooden mountings on an ordinary concrete base, the vibration was excessive, and extended over a radius of 25 yards. In the Paris Exhibition of 1878 there was shown a block of bituminous concrete, weighing 45 tons, forming the foundation of a Carr's disintegrator used as a flour mill, and making 1,400 revolutions a minute, a speed which would have been impracticable on an ordinary foundation. Extensive applications of the material for this purpose obtained in France, especially in connection with steam engines and steam hammers.

Another use of asphalt was for the flooring of powder magazines, where its non-spark emitting character made it particularly valuable. It was also largely applied in France, in the form of gritted mastic, for the flooring of casemates in fortifications, and in its pure liquid form for the coating of vaults and arches, where it protected the masonry from damp, and the subsequent disintegration caused by infiltration and by frost.

In conclusion, the author referred to the imitation asphalt occasionally brought forward, and by some regarded with favor on the score of cheapness. The best of these, if properly made, was as dear as the natural material, without in any degree possessing its special qualities of appearance and durability; and in no case were any of them suited as paving materials to resist heavy traffic. In Paris the tricks of irresponsible paving contractors were many, and necessitated constant vigilance. Inferior cement was put into casks bearing established brands, and the concrete made with such cement was put down in thinner layers than was paid for. The author had even known cases where the concrete was omitted altogether, a layer of common mortar taking its place. Such foundations would insure the failure of the best asphalt, which ought to be considered only as a wearing surface or armor to the concrete. But the mode most difficult of detection was the ostentatious display, at the site of the works, of cakes of the particular asphalt specified, while an inferior material was in the boilers. Once laid, wear alone would reveal what had taken place. From these

Fig. 11.—Rockery.

malpractices asphalt had occasionally suffered unmerited condemnation, but the author claimed that with *bona fide* materials and workmanship satisfactory results could always be obtained.

* From a paper by Mr. W. H. Delano, lately read before the Institution of Civil Engineers,

Imitating Watermarks in Paper.

The following method for imitating watermarks is published in a number of the *Obsor Graphitscheski Iskustvo*, which is particularly suitable for designs, etc., in half tones. A plate glass plate, with the edges previously ground, is polished with talc, and the ground edges covered with weak albumen, then coated with collodion; afterward a solution of gelatine, lump sugar, and bichromate is poured on, so as to cover it equally to the thickness of one and one-half mills. When dry, detach, and expose under a negative in the sun.

In the meantime cover a polished zinc plate sparingly with a solution of gelatine in acetic acid containing a grain or two of chrome alum; after drying well, wash in hot water and stand up to drain. Now take the exposed gelatine, dip it into alcohol, and, while wet, squeegee it on to the moist surface of the zinc plate; in a quarter of an hour it is ready to develop and harden, the same as for pigment work. When the relief is thoroughly dry, it is only necessary to lay a sheet of fine paper over it, and pass it through a rolling press, to obtain an exact *facsimile* of the negative.

Our Berlin contemporary for October last contains an example of a similar method to the above executed by Messrs. Werner & Schuman, who have patented the process in Germany under the name of photo-diaphanie.

Herr Meyer has hit upon a plan for producing such watermarks, which is novel in the extreme, and at the same time very simple. A print of the required design, either from a typo-block or an India-rubber stamp, is pulled in a very sticky ink on a sheet of glazed wave paper; over this strew some fine silver sand, and let it dry for a short time, then brush off the superfluous sand, and place a damp sheet of evenly gummed paper carefully over it, and place between the leaves of a letter copying book to dry under pressure. The matrix so obtained can be used on either side, so that if it is placed between two sheets of paper, and the whole run through a rolling press, it will give two very good imitation watermarks. This, of course, has the drawback that

Fig. 12.—Vase.

it is only suited for line work, but, as Herr Meyer justly remarks, it can be used for a variety of purposes, such as drafts, checks, etc.; or any one furnished with a *facsimile* done in the above manner could use it for indorsing bills, etc., by merely passing the same, together with the *facsimile*, through a lithographic or rolling press.

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MISCELLANEOUS INVENTIONS.

Veneers made of paper have been used in place of wood veneers to a limited extent. That they have not come into general use is due chiefly to the fact that the oil applied to their grained face prevents the due adhesion of the glue or cement by which they are attached to any wood surface to be ornamented. Mr. Isaiah M. Clark, of Coldwater, Mich., has patented a new, simple, and economical process, pro ducing a paper veneer having an oil grained surface, and which will adhere to any object as firmly as wood veneers.

Mr. D. W. Clark, of Tidioute, Pa , has recently taken a patent for an improvement in window sashes, which all housekeepers will regard with satisfaction. It consists of a very simple arrangement of the sash, by which it may be quickly removed for cleaning, glass setting, or other pur poses, and as quickly restored. A dwelling house furnished with these sashes has a positively increased value, for the glass work may be kept in handsome condition with much less labor than heretofore. This is an invention that is needed in almost every household. Considering that it is applicable to every window in every house, it will be seen that the uses of the invention, even in a small town, are quite extensive.

Mr. Allen Cox, of Boston, Mass., has patented a sheet metal pan, made without rivets, wire, or solder, and having its ring secured to it without the use of rivet or solder. It has edges as strong and as durable as the ordinary wire edged pan, is of somewhat less weight, is more convenient, as its broad, flat edges afford a good hold in putting it in or out of an oven. It can be manufactured at a greatly re-duced cost of material, time, and labor.

An improvement in library lamp fixtures, patented by Mr. Joseph Kintz, of West Meriden, Conn., consists in a novel construction of clamping rings for holding the shade, and in the manner of fitting the stops that arrest the movement of the lamp in raising it.

Mr. Henry B. Winslow, of Marblehead, Mass., has patented an improvement in apparatus for the manufacture of lampblack. It consists in a certain novel construction, whereby the use of water is dispensed with and the character of the production improved.

A self-locking hook, so constructed that the weight of traces or other tension strain will hold the hooks locked to prevent them from becoming accidentally unhooked, has been patented by Mr. Joel R. Haines, Mount Laurel, N. J. The invention consists in forming upon the shank of the hook a toothed head, a toothed collar placed upon the rounded shank of the hook to engage with the toothed head, and a loop or half link attached to the toothed collar to re ceive the trace or other article and serve as a guard to prevent the hook from becoming accidentally unhooked.

An improved type clamp, patented by Mr. William J. Adams, of Philadelphia, Pa., consists of four tongued and grooved flat metal bands, each bent at a right angle, so that when fitted together they form an adjustable rectangular frame that may be extended or contracted as required to fit a form of types.

A binding for oil cloths, so constructed as to confine and protect the edge of the oil cloth while allowing the binding to be rolled into a coil, for convenience in handling, storage, transportation, and use, has been patented by Mr. George S. Eaton, of Brooklyn, N. Y. The invention consists in a flexible metallic oil cloth binding, made with a thickened flanged edge to rest against the edge of the oil cloth, and at the same time allow the binding to be wound into a coil.

Messrs. Elias Leak, of Longton, and John Edwards, of Fenton, England, have patented an improved apparatus for supporting pottery ware in kilns and ovens This invention relates to certain improvements in apparatus for supporting pottery ware in kilns and ovens while being baked, glazed, or otherwise fired, and has especial reference to the seggars in which the ware is placed and supported while in the kiln or oven.

An improved lamp burner, patented by Mr. Orlando Mer rill, of Courtland, Ala., is so constructed that wider and narrower wicks and larger and smaller chimneys may be used with the same burners.

Mr. Joseph Kintz, of West Meriden, Conn., has patented an improvement in extension chandeliers, which relates to the means for retaining the extension rod of a chandelier in any position, as drawn out to lengthen the chandelier, and for releasing it, so that the spring may act to draw up the rod. The inventor makes use of a slide rod having its surface grooved or ribbed concentrically and sliding in a collar that is fitted with loose sectional nuts or clamping blocks, which are inclosed within a beveled cup or ring. The cup is moved in one direction by a spring to force the nuts inward and clamp the slide rod, and is fitted for movement by hand to release the nuts by means of a trigger placed in a convenient position operating through a sliding tube that is connected to the cup.

Messrs. Amos A. Deuse and James Deuse, of Chester, Conn., have patented a die for forming double spiral grooves in bits or gimlets, consisting of the two halves having the longitudinal and slightly tapering grooves and diagonal cross-bars, one pair of the bars being smaller than the other.

A chop conveyer for millstones, patented by Messrs. James H. Ellis, Alexander Scott, and Eli S. Edmondson, of Goderich, Ontario, Canada, consists in a spiral conveyer fitted to revolve in a channel around the bedstone and below the level of the grinding surfaces, which carries the chop to a discharge spout; also, in the construction and manner of operating the conveyer.

Business Success.

Among the rare bits of wordly wisdom uttered by Major Eastburn, one of the former magnates of State street, whose familiar face and form as he stood at his office door at noon day will be recalled by many, none may be more profitably considered at the present time than his comment on making haste to be rich. "I've stood here on State street," said he, "for forty years, and I have seen men accumulate fortunes by speculation, and I've seen these fortunes disappear I have seen men go up in worldly wealth, and go down, and I've always noticed that those persons who were content with slow gains and six per cent interest came out ahead in the long run." The greatest of proverbial philosophers has also said, "A faithful man shall abound with blessings but he that maketh haste to be rich shall not be innocent," and again, "He that hasteth to be rich hath an evil eye, and con sidereth not that poverty shall come upon him." He hastens best who hastens slowly; not lazily, for there must be work, backed by energy, perseverance, intelligent self-denial, and thorough business habits. Believers in business impossibilities are not as numerous as formerly. For years we seemed to be living in the atmosphere of venture and great undertakings, and our whole industry was tinged with the unearthly light, but of late years we have been suffering from a collapse of these great hollow ideas, and there is hope for a return of the staple prosperity of earlier times.

The past six years of depression has solidified all branches of business. Prudence and economy is now the motto of the successful merchant. The misfortunes of the past did not come for naught. It is a delusion to suppose that success is attained by any kind of patent process. Books are sometimes advertised with such taking titles as "The Secret of Success," "The Road to Wealth," etc., but they make the path of success no plainer or easier for those who are looking for a short road to wealth, power, honor, and influence. These come only of years of intelligent labor and devotion to business, prudence, economy, honest dealing, courage, and perseverance. He that would have true and lasting success must deserve it. A fortune won by blunder or accident, by short cuts, by strategy, or close bargains is not success, and is likely to leave its possessor as quickly as it came. Success must be conquered in a legitimate way. The man who enters business only for plunder and gain, with no thought of his reputation or character, is not a good busi ness man, and is never regarded by his fellows as a success ful man. The truth is that real success does not mean wealth, social position, or political honors alone. To these must be added honesty, a heartfelt consideration for others, civility, promptitude of thought and action, intelligence, so briety, and every manly virtue.

The truly successful business man is one who is complete in everything that belongs to his calling. He has a thorough knowledge of what has been done in his business, and ap plies this knowledge with untiring diligence to the under takings before him. He watches and studies the markets, knowing how much is produced of the commodity in which he deals and the amount consumed; he is prompt in decision and execution, truthful in word and conduct, and keeps his credit unimpaired. In all that he does he commands the respect and confidence of all with whom he deals, and maintains a high and noble character before the world, which is beyond all price. The principal of the "survival of the fittest" is nowhere more applicable than in business matters. The unworthy and incapable are sure in the long run to sink to their proper level.—*American Manufacturer and Exporter.*

How Copyright Differs from Patent Right.

The Supreme Court of the United States has lately given two opinions which illustrate what mistaken notions of copy-right are sometimes held by courts, as well as by lawyers and clients. Some years ago Charles Selden, of Cincinnati, published a book entitled "Selden's Condensed Ledger, or Book keeping Simplified." In this book, and in one or two others that he published about the same time, the author ex plained a new system of book-keeping which he had in vented, and gave such directions, specimen pages, headings, etc., as would enable a person to understand and apply the system. Each of these books was duly copyrighted. Sel den claimed that his copyright secured to him a monopoly of the system which he had invented, and demanded a roy alty for the privilege of using it. The system appears to have been a desirable one, and the royalty was paid by a goodly number of persons, including not a few county audi tors. But others made use of it without asking the inven tor's permission or paying any royalty, and one person published a book embodying substantially the same method. Litigation resulted, and the question was raised whether Selden's plan or system of book-keeping was protected by the copyright of his books. The Circuit Court of the United States decided that it was. This judgment is now reversed by the Supreme Court, which does not deny that a work on book-keeping may be the subject of a copyright which will prevent the unauthorized copying of the book. But the system or secret of book-keeping described in the book is not a subject of copyright. This is an invention for which protection, if any there be, should be sought under the patent laws. The court drew a distinction between a book as a composition and the art, process, or secret described in it. "A treatise on the composition and use of medicines," says the opinion," "be they old or new, on the construction and use of plows, or watches, or churns, or on the mixture and application of colors for painting or dyeing, or on the mode of drawing lines to produce the effect of perspective, would be the subject of copyright; but no one would contend that the copyright of the treatise would give the exclusive right to the art or manufacture described therein."

In the other case referred to, copyright was claimed in a map of New York city constructed on an original and peculiar plan. Substantially the same plan was used without authority in a map of Philadelphia. The United States Supreme Court, without denying that the unauthorized publication of the map of New York would be piratical, held that the copyright did not protect the mere plan, and hence did not prevent the defendant from making a map of another city on the same plan.—*N. Y. Times.*

A File of Novel Construction.

The *Ironmonger* states that at a recent meeting of the Royal Scottish Society of Arts, Mr. J. Kirkwood, of Edinburgh, described a new file for soft metals and wood. This tool is formed of about 200 pieces of separate steel, connected by an iron bar which is passed through the whole and bound together by a screw. The advantage claimed for the file is that filings of soft metals or wood can be got rid of by simply loosening the screw, and thereby separating the plates, this being done with very little delay or inconvenience. Each file will, it is said, last three years, outwearing 30 dozen ordinary files. The cost of the latter would be 36*l.* and the saving that would be effected by using the new file would be 32*l.* Mr. Kirkwood's file is said to be capable of performing quicker and better work than the cut files in ordinary use.

This file seems to be simply a copy from American patents granted several years ago. For example: J. W. Houston's patent, January 19, 1858, shows a file made as above described; G. B. Cubberley's patent, June 2, 1868, ditto; J. H. Clark, July 5, 1870, ditto. In all of these patents the tool is formed of separate pieces of steel, connected by an iron bar, passed through the whole, bound together by screw, and operated as above mentioned.

British Solidity and Caution.

Our neighbor, the *World,* pungently remarks that if the evidence about the Tay Bridge had been given concerning an American structure which had tumbled down and killed ninety or a hundred persons, would not our esteemed British contemporaries have denounced American fraud and flimsiness? As to the metal used for the columns, moulders employed in the work for twenty-seven years "never saw worse;" the coke used for melting it was inferior; holes and cracks were patched up with cement; none of the defective columns, "which were numerous," were broken up, but went into the work, and so on. The most favorable testimony was that of one of the foremen who had been engaged in casting these columns, and he said that the material "was not so terribly bad—for building iron." Not a few witnesses, such as ex-Provost Robertson, of Dundee, an engineer, testified as to the habitual recklessness of the drivers on the bridge. . . . Other habitual travelers gave up the bridge on account of the oscillations and took to the ferry. Altogether the evidence thus far taken seems to indicate such "scamping" in fitting up the bridge and such recklessness in using it as our British brethren have been accustomed to depict as exclusively and characteristically American, and to compare, to our manifest shame and disadvantage, with British solidity and caution.

More New Mines.

The Tucson (Arizona) *Citizen,* of February 7, contains the following: Some exceedingly rich mines have been discovered on the east side of the Graham mountains, in Stockton's Pass, about twenty-two miles from Safford and twelve from Fort Grant. The first locations here were made by B. D. Jones, brother of Senator Jones, and since that time locations have been made by others. The most important claims developed are the Delaware and the Pioneer. The ledge is two and a half to three feet wide, and traceable from 1,800 to 1,900 feet without a break. The assays are $2,300 in silver and $722 in gold. The claims are situated on the north side and in plain sight of the main traveled road. The discoveries have created considerable excitement, and many prospectors are flocking there. One of Jones' mines, the Garibaldi, carries magnificent gold ore, the shining particles being visible in every piece of rock. There is plenty of wood, water, and grass in the vicinity, and a town site has already been located.

A RAILWAY with some novel features has been recently opened between the station of Ribeauvillé (on the Strassburg Basle line) and the town of that name, about 4 kilom. distant. The line is on the road (with which the rails are level), and has a narrow gauge of one meter. There are inclines of forty mm., and curves of fifty meters radius. The train requires only one engineer and one guard. The locomotives weigh nine tons, and among the rolling stock are ten platform wagons, which are arranged for conveying wagons from the main line, without the goods being transferred. These platforms carry two rails, corresponding to the normal larger gauge, and they rest on two bogie trucks, having four wheels each. Thus the larger wagons can be conveyed over the sharpest curves of the narrow line. These platform wagons weigh three tons, and the large wagons, with full charge, weigh fifteen tons, giving a total weight of eighteen tons, which, divided among the four axles, gives a maximum load of only four tons fifty per axle. Passengers, as well as goods, are conveyed on the line. The total cost of the line has not exceeded 250,000 francs.

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AMERICAN INDUSTRIES, No. 38.

THE MANUFACTURE OF PRINTING INKS.

On the first page of this paper we illustrate the leading processes of the printing ink manufacture, as conducted by one of the oldest houses in that branch of business. In the early history of printing it was common for printers to make their own inks; but with the more varied requirements of modern printing offices, it has been found that greater economy and generally better results could be obtained by making of this department a separate trade.

The making of first quality printing inks is a nice operation; it requires a high degree of skill and a nicety of judgment obtained only by long experience, although the general methods employed have shown but little change in many years. All practical manufacturers have, however, certain trade secrets, the value of which would be recognized only by an expert, but which they carefully guard, touching details of grinding the color, making the varnish and lampblack, and the various pigments they employ in colored inks.

In our illustrations the view at the upper right hand corner shows the furnaces in which the lampblack is made. This is the color basis of most of the black inks, although finely divided charcoal and occasionally other blacks are also used to some extent. The making of the black is a simple and well understood process, but on the materials employed therefor and the quantity of black used depends much of the success of the ink manufacturer.

The picture to the left at the top, showing the varnish making, presents a part of the business on which, quite as much as the color, depend the distinctness and brilliancy of all first class inks. Linseed oil is largely used for this purpose, though other oils are likewise employed, and resin oil has been extensively used in the cheaper inks. By boiling the fatty constituents of the oil—glycerine, palmitine, etc.—are volatilized. For the best inks, the oil is clarified by digesting for some hours with dilute sulphuric acid at a temperature of 212 degrees, then washing with hot water, when it will dry quickly and thoroughly; the oil is then boiled, and the inflammable vapors that rise are ignited, which, after burning for some time, are extinguished by a cover placed over the vessel. In order to promote quick drying, manganese in its different states and other driers are sometimes added. The view entitled "color plant" shows the department where the various pigments for colored inks are prepared. These are made of almost everything which can be practically worked to give the different shades desired, either mineral, animal, or vegetable, the pigments being prepared so as to be as little liable to change as possible, and then kept on hand to make the basis of the different colors, by taking exact quantities or proportions by weight of each. The coal tar or aniline colors have been very fashionable for some years, and, although they give great brilliancy at first, it has been found they are not lasting.

The black ink making room at the right of the general view shows where the lampblack or other carbonaceous blacks employed are mixed with the hot compound of burnt oil and resin. The mixing is effected in a cylindrical vessel by a revolving shaft with fingers.

The color grinding, as shown in the large view at the bottom of the page, is done by powerful iron or stone mills, in which rollers of great strength, driven by steam power, reduce the mixture to so fine a state that no coarse particles can possibly pass.

Besides the ingredients mentioned above, soap is sometimes used in order to prevent smearing, assist in obtaining sharpness of impression, and help to make the ink leave the types readily when the paper receives the impression. Yellow resin soap, thoroughly dried in slices and reduced to powder, has been considered the best for this purpose.

The qualities which good ink must possess are as various as the widely different uses for which it is employed. Some ink is made to print on dry paper, and some with the sheets wet; highly finished stock requires an ink of different body from that which is to be used on soft paper. All fast printing must have an ink especially adapted for that purpose, and in printing on tinted papers, either with black or colored inks, the best results are only obtained where the ink is made especially for the particular work in hand. The rollers with which the ink is spread over the types must not be injured by any substance in the ink, but the ingredients of the latter should rather be such as will preserve and keep the rollers in good working order. Copper and steel plate printing, and also printing on stone, each require different kinds of ink, and it has been customary with plate printers and lithographers, until within a few years past, to make their own inks. To this department of the business, the firm, since the introduction of steam presses, have given great attention, and their efforts have been attended with conspicuous success, both in black and colored ink.

The making of fine printing inks was first commenced in this country by Mr. George Mather, in 1816. Previous to that time the finer qualities of ink were imported from England and France. This led Mr. Mather, who was a practical printer, to turn his attention to ink making, and after a long series of experiments, he succeeded in making black inks equal to those which had previously been imported. Mr. Mather died in 1861, but the business which he had established and so long conducted was, four years before his death, turned over to two of his sons and his son-in-law, Ralph N. Perlee, who continued it under the firm name of Geo. Mather's Sons. In 1878, Mr. D. W. C. Mather retired from the business, and the present members of the firm consist of S. Talmage Mather and Ralph N. Perlee.

About the time of the retirement of Mr. George Mather from business, color printing was being developed. Mr. Mather had produced, for many years, such colored inks as printers needed for special and immediate use, as shown in the title pages of "Harper's Pictorial Bible," printed in 1847, and other illuminated works, but now a call had risen for stocks of ready-made colored inks, to be kept in store. Consequently, a thorough course of experiments were made chiefly under the directions and personal tests of Mr. Perlee, which were attended with such marked success that the firm obtained the orders for almost the entire amount of letterpress colored inks used during the war for printing the government "greenbacks" and bonds. At this period also, the issue of pictorial papers became a large business, and an entire change in the ink manufacture was necessitated for the production of an article which would be best adapted for the work, and here also Mr. Perlee's efforts were eminently successful. The Picturesque Europe and America the Picturesque World, the Art Journal, and many other works of this character, have been printed with the fine woodcut inks of this firm.

The ink works, as shown in our engraving, are located at Jersey City, and the large establishment now required for the manufacture forms a striking comparison with the limited premises and primitive conveniences which sufficed for the business of the house when it was first established. It is always pleasant, however, in making this record of the development of our leading industries, to note the progress of a long established branch of manufacture, as is shown in the history of ink making by this firm, their factory being the only one which has been in continuous operation for so long a period as sixty-four years.

The New York office of Messrs. John Mather's Sons is located at No. 60 John street.

Safeguards to Human Life.

Mr. T. Blake, M.P., recently addressed a meeting of the electors, in which he took severely to task the administration and the war policy of England in sending an invading army into Zululand. Among other remarks he said: "I regard human life as the most sacred thing. How it is guarded in England! Even if a man has to be put to death, look at the many safeguards there are that his condemnation shall be just, and that the sentence shall be as humanely as possibly carried out. He is first tried, an advocate being provided for him; and if he be condemned there is a minister of religion in the person of the jail chaplain to attend him to give him spiritual counsel and comfort. Everything is done to prepare him for his end, and then on the dread day when he is to suffer the last penalty of the law, the high sheriff—who is a bigger man altogether than the Lord Lieutenant—is there, or some one to represent him, to see that the sentence is carried into effect. What, however, do we do with a man who, instead of having killed only *one* other fellow creature, comes home from the field of battle, having killed *many* men with his own hand or helped in the slaughter of many hundreds or thousands of his fellow creatures? To such men we give titles and distinctions, and we present them with swords of honor. Calcraft, that late public hangman, exercised his office for the government for a number of years. He took the lives of persons condemned to die, and he strove to do his task as expeditiously as possible, so that the suffering should be as short as might be. He did this work of his for many years. But Calcraft received no pension at the end of his official career; he was never presented at court; he was not made privy councillor; they did not even give him a new rope. They give an army officer, whose hand is also red with blood, a new sword. Calcraft, and his successor, Marwood, did their dread work in the name of the law, in the name of the Queen, and in the nation's own appointed way. Why do we hold them in such abhorrence, and yet applaud the man who cruelly takes the lives of his fellowmen, if they are of a different color, who have done no wrong? A man who kills his fellowman is justly regarded as a murderer, while the man who kills 1,000 men, or is the cause of their being killed, is lauded and honored, and is regarded as a great hero. There are some of those officers who have returned from Zululand who exult over the number of Zulus they put to death with their own hands. The men who fight the wars are, it is to be remembered, not the men who make the quarrels. If those who make the quarrels were but to fight them out themselves we should have, I think, but few wars. Everything that adds to the war spirit of the country—as our immense outlay in armaments does—is a national curse. However, I must not dwell too much upon this war policy; but I feel strongly about the sanctity of human life, and that war should be entered upon only as a very last resort. For what, after all, does war determine? Not which part to the quarrel is in the right, but simply which is the stronger. I, therefore," concluded the speaker, "advocate arbitration between nations and the settlement of their quarrels in much the same way that individuals are obliged to settle theirs."

Catching a Cannon Ball.

Recently, at Leeds, John Holtum, a gymnast, was charged before Mr. Bruce, the stipendiary magistrate, with unlawfully wounding Elijah Fenton, a market porter, in the Princess Concert Hall, in that town. Holtum had, during the week, been giving performances showing extraordinary strength in the handling of heavy clubs, cannon balls, etc., and on Friday night he offered a prize of £50 to any person who could catch a ball fired from a cannon as he (Holtum) had done on several consecutive nights. The challenge had been accepted by three men, and a cannon having been placed in position on the stage, a suitable cartridge and a ball weighing seven pounds were rammed home. When Holtum called upon those who had accepted his challenge, Elijah Fenton presented himself, stripped off his coat and waistcoat, and, standing about six yards away from the cannon's mouth, declared that he was ready, and placed his hands in a position to secure the projectile. An attendant fired the cannon, when, to the horror of all present, the ball struck Fenton in the forehead and knocked him down. He managed to crawl off the stage, and at first it was thought that he was not much hurt. Shortly afterward, however, the case assumed a much more serious appearance, and Fenton was removed to the Leeds General Infirmary, where it was found that he had received a compound fracture of the skull, and that his recovery was almost hopeless. The stipendiary magistrate remanded Holtum until Tuesday. Mr. Hobson, the proprietor of the Princess Concert Hall, promised that the performance in question should not be repeated on his premises, but stated that Holtum had been performing on the Continent in this way for five or six years, and never had an accident of this kind before.—*London Times.*

Blistering of Paint and Varnish.

BY FRANK FIELDING.

Many are the opinions expressed regarding blistering, and although some very sensible theories are advanced, we are inclined to believe that the bottom of the subject has never been reached. We hold an opinion of the cause of this trouble, and it may be that this opinion has been forestalled by others, but as we have never seen the points laid down in print, we present them here.

Blistering of a varnished surface after the varnish has had proper time to harden is due to the evaporation of moisture which lies confined under the shell of varnish. This evaporation is caused by heat, and it is seldom, if ever, a blister will rise upon a varnished surface without the temperature is raised to an extreme degree, near to that which the varnish received in its manufacture.

The accumulation of moisture *under* the varnish may be brought about in several ways; the most particular one being in the closing in of moisture in the rough stuff. During the rubbing of the rough stuff the water used is partly absorbed, and unless due care is taken to give ample time for "drying out" before the application of subsequent coats, a great amount of moisture will be confined within the cells of the rough stuff.

Boiled oil contains moisture, as of water, and in cases where steam is used to express the oil from the seed this percentage is increased. Turpentine, an extremely volatile liquid, also forms an evaporating substance which is rendered active by a slight heat, and in its haste to reach the air it disturbs the outer surface, either lifting an elastic coating into bubbles or blisters, or bursting open a hard and inelastic one into cracks.

The primary cause, then, of blistering is moisture either in the form of wet moisture or of evaporating liquids, such as turpentine. The wood may be unseasoned, or it may have been wetted in the course of preparation, such as steaming to bend, etc. The rough stuff water may have been applied before the evaporation of liquids had taken place, either of which would bring about disastrous results.

"Dry blistering" is simply the hasty absorption of the liquids from outer coats by putty or paint which is expressly porous, depriving the coating of the requisite amount of binding and adhesiveness.

To prevent blistering, close up every lurking place for moisture by the use of the A B C system of painting, which will be found to be as easily done as repeating the alphabet. Be careful to have each coat dry before applying another, and you may laugh at the trouble which some of the craft call "deviltries."—*Coach Painter.*

Effect of Intense Cold on Beer.

There are some advantages and many disadvantages to the brewer arising from very cold weather. Beer keeps far better when the thermometer stands below 50° F., but when the thermometer is for days several degrees lower than the freezing point, the usual arrangements for storing beer in this country altogether fail to keep it in good condition. The ordinary cellars, both of breweries, retail establishments, and private houses, are but ill adapted to protecting beer from intense cold, and the result has been apparent during the last few weeks in large quantities of beer either turning up cloudy or failing to drop bright; with a reduction of temperature there is a diminished power of holding albuminous bodies in solution, and therefore some of these separate, producing a cloudiness which requires a long period of high temperature to remove again. Another result of cold weather is to cause beer to turn flat; in its normal and healthy state beer should undergo a slow but regularly secondary fermentation, by which a certain amount of carbonic acid gas is evolved which serves to keep up the "life" of the beer; at very low temperatures the organisms which cause this fermentation are inactive, and no gas being evolved, the beer becomes flat. The greatest danger to beer during the winter months is the sudden changes of temperature; with the thermometer one day at 55° F. and the next at 25° F., it is impossible to keep beer in condition, at least with the usual cellar arrangements which prevail in this country.

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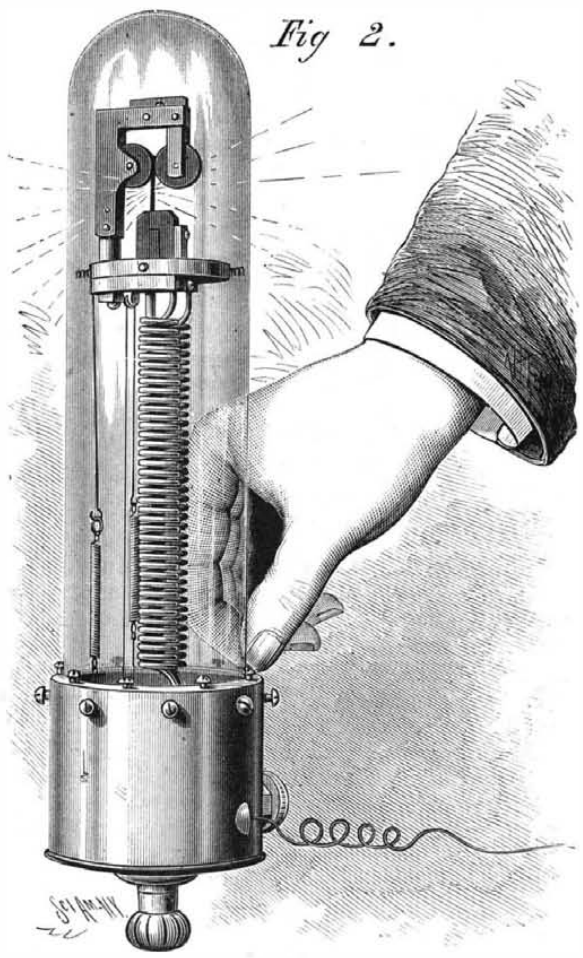
THE SAWYER ELECTRIC LIGHT.

The practical working of the Sawyer system of electric lighting was recently exhibited to a few gentlemen in an ordinary up-town residence on West 54th street, in this city. Seven lamps were distributed at convenient points—one in the rear of the hall, one upon the center-table as a drop light in the front parlor, two upon a double arm gas fixture of the ordinary pattern in the front parlor, and three in the rear. It is stated that the seven lamps are operated upon one electrical circuit, supplied by a single generator transferring four horse power. The current travels about 1,600 feet through conductors having a diameter of a quarter of an inch.



THE NEW SAWYER LAMP.

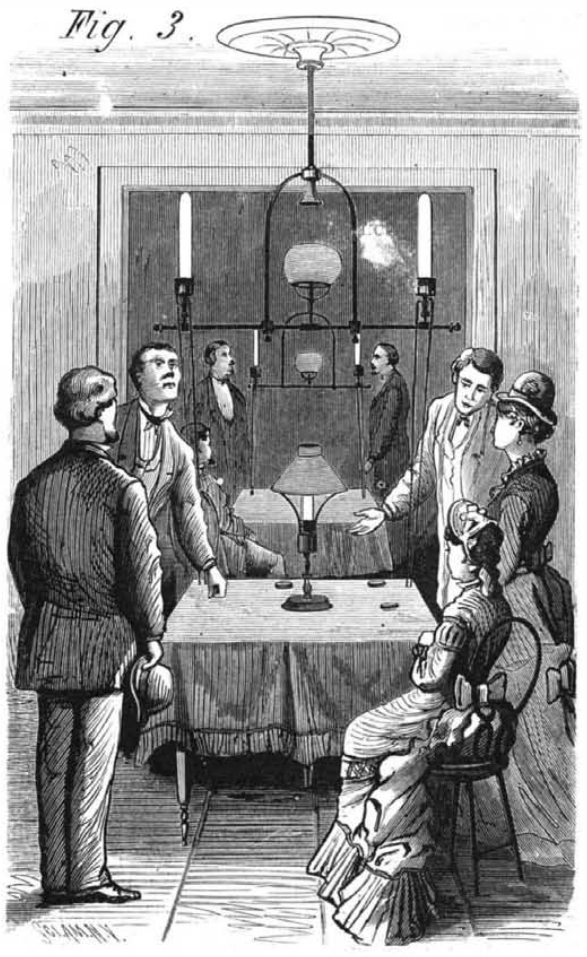
The lamp, based upon the incandescence of a pencil of carbon immersed in nitrogen gas, is in no way different in principle from the Bouliguine or the old Sawyer-Mann lamp exhibited some years ago. The pencil is contained within a globe two inches in diameter and ten inches high, sealed at the bottom by means of a cement, which, while adhering perfectly to the glass and metal, is sufficiently elastic to compensate for the unequal expansion of the two. It softens only at a temperature of 500° Fah. The globes are charged by the process invented some time ago by Thomas B. Stillman, which is so simple in its details and so rapidly operated that a single workman can prepare fifty lamps per hour at a cost of about thirty cents, in such a manner that, according to Stillman's calculation, the amount of atmospheric air remaining is only an infinitely small fraction of the normal quantity.

The large engraving on this page illustrates the manner of filling the lamps with nitrogen gas. Several lamps are placed upon a stand and connected, one with the other, so that the gas that fills the last lamp in the series must pass through all of the others. In this manner the gas is made to do double duty. The nitrogen gas is generated by a process which is not made public. It is stored in gas bags, and when required for use it is forced from the bags by heavy weights through the purifying and drying tubes, A, sodium, B, and bottle, C, whence it is conducted by a flexible tube to the series of lamps on the table, D. The last lamp in the series is provided with a flexible tube dipping in water in the jar, E, to prevent the re-entrance of air to the lamps when the flow of nitrogen is shut off.

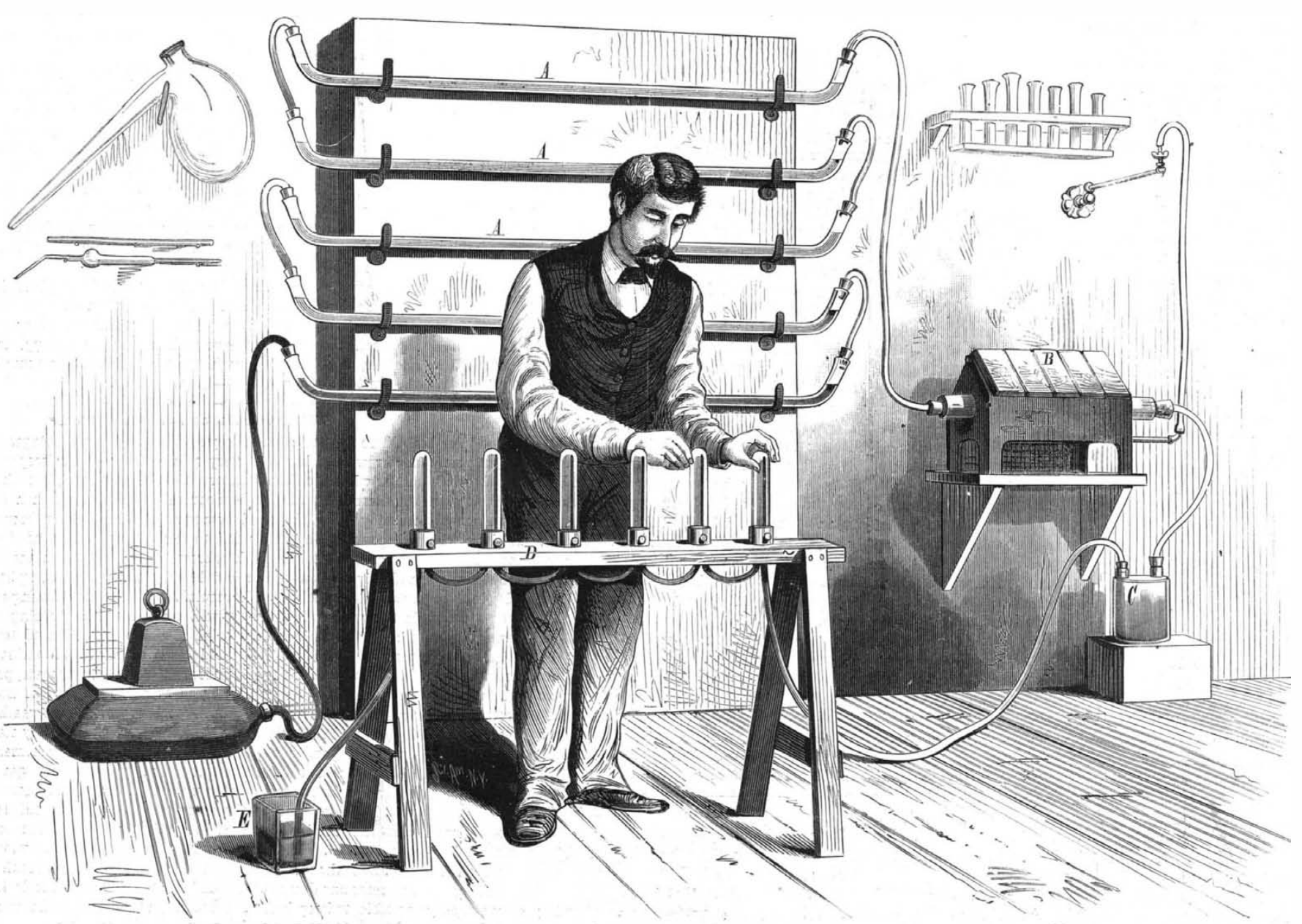
The sodium furnace, B, contains a wrought iron tube partly filled with melted sodium, through which the nitrogen is forced to remove traces of oxygen. The bottle, C, is simply filled with fiber to prevent small particles of sodium oxide from reaching the lamps. The cost of the nitrogen is stated at eight tenths of one cent, and that of its purification as one and one fifth cents; the total cost of recharging a lamp, when the nitrogen is exhausted or becomes mixed with air, being, inclusive of the wages of the workman, two and three fifths cents, against a cost of seventy cents for the process usually employed. The carbon pencil, seven inches in length and about three thirty-seconds of an inch in diameter, is fed upward as fast as disintegration takes place at the point of contact, by means of a regulator, which will be substituted by an automatic feeder as soon as the arrangement can be perfected. Mr. Sawyer says that one of these pencils, used for five hours a day, will last at a minimum calculation from his experiments, not less than ninety days, and, at a maximum, for two years. The cost of the pencil is a trifle less than two cents, and the cost of replacing and recharging with nitrogen nine and three fifths cents. The bag of sodium and the large spiral conductors at the base of the carbon, which were distinguishing features of the Sawyer-Mann lamp exhibited about a year ago at No. 94 Walker-street, have been discarded. Two small steel rods take the place of the latter. The globe, which is not unlike the chimney of an ordinary kerosene lamp in general appearance, is embedded in a nickel-plated base, which may be highly ornamented or not, according to the taste or means of the user.

Photometric tests, it is said, have been made with a Sugg photometer, such as is used by the gas companies for the same purpose, and each light was registered as equal to twenty-seven and five tenths standard candles, or a little more than twice the value of a five-foot gas burner, which usually registers from ten to twelve standard candles.

Mr Sawyer claims that his system of distribution is entirely novel and original, but declines for the present to give a description of it, his patents not having been as yet secured. The regulator, we are told, is based upon the plan used by the old Berlin house of Siemens Brothers, by which only such a volume of current is supplied as is necessary to overcome the resistance. The light is readily toned down to a glimmer by turning a button in the wall. In its optical pro-



EXHIBITION OF THE SAWYER ELECTRIC LIGHT.



FILLING THE SAWYER LAMPS WITH NITROGEN.

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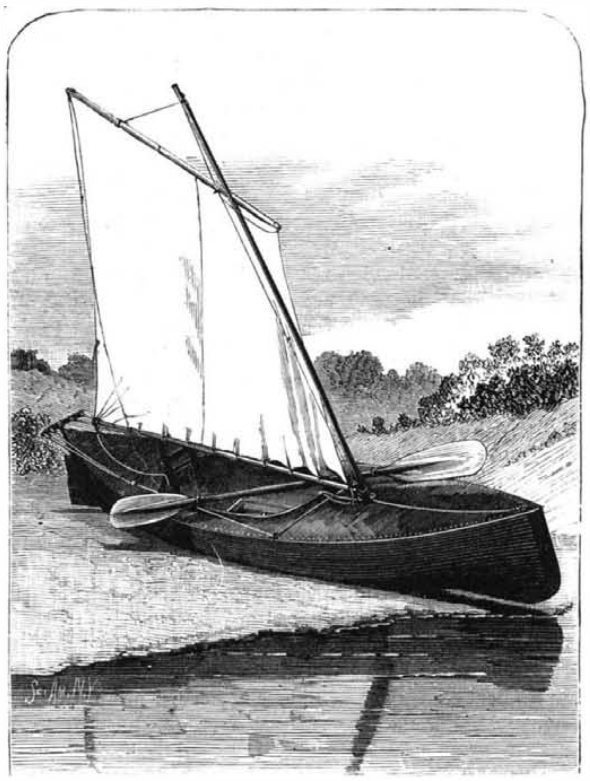
perties this light is much like gas. It is yellow, steady, and soft, and consequently not irritating to the eye. It has none of the blue rays incident to the voltaic arc arrangement, and the shadow cast by intervening objects is softened and mellowed at the margin. For practical purposes it is intended that the power of each lamp shall not exceed that of two ordinary gas jets.

The relative economy of this system of lighting we are unable to learn. "Approximate estimates" of cost make it much cheaper than gas; but in the absence of specific data for exact calculation, such estimates do not go far to satisfy the popular mind.

THE RACINE CANOE.

The pretty little canoe shown in the annexed engraving is the outgrowth of the experience of the Racine Boat Company during the year 1879. It is made of birch, cherry, or cedar, according to the taste of the purchaser. Three sheets of the wood are cemented together with the grain of the inner sheet crossing the grain of the outer sheets, and the whole, while green, is pressed into the desired form under heavy pressure, making a body with but a single seam under the keel. The decks are made in the same way. The ends are nicely sheathed with brass, and the boat is finished with coach varnish, bringing out the beauty of the wood.



THE RACINE CANOE.

The boat thus made is very strong and not liable to injury with ordinary usage. It never leaks, and it is in every respect complete and well finished, and is of the most approved model.

The dimensions of the boat are as follows: Length, 13½ feet; beam 28 inches.

The boat shown in the engraving, when full rigged, weighs but 80 lb.

The parties building this, make open canoes, row boats, and shell boats on the same plan. They are finished with water-proof fillings and varnishes, and are very handsome and desirable. In a canoe similar to the one shown in the engraving, a trip was made late last season from Racine, Wis., to New Orleans, La., a distance of about twelve hundred miles, *via* lake, canal, and river.

Further information may be obtained by addressing the Racine Boat Company, Racine, Wis.

THE FRANKLIN DRAUGHT REGULATOR.

The accompanying engraving represents the well known device in common use for operating a damper in the flue of a steam boiler by steam pressure. This device is substantially the same as that patented by Patrick Clark, in 1854, but it is combined with a recently patented improvement known as the Franklin regulator.

The improvement consists in erecting above the weighted lever, A, a plate, B, from which is suspended any desired number of weights (*a*, *a'*, *a''*) by rods which are furnished above the plates with thumbscrews, and are forked below so as to straddle the lever, A. The suspension rods and their weights may be so adjusted by the thumbscrews that the lever, when it rises under the pressure of steam, will, after reaching a given height, be loaded by one weight, and after overcoming this load and rising further, will receive another load, a third load being added by another weight after the lever reaches a still greater height.

When there is a slight excess of pressure of steam in the boiler, the lever, instead of being raised far enough to entirely close the damper, as in previous devices of this class, will be arrested in its upward movement by one of the weights, which gives the lever an additional load to carry, and to oppose the excess of pressure, the damper being closed to the limited extent determined by this additional load.

Should the pressure of steam in the boiler be reduced and resume its normal condition, the lever will fall to its original position, the weight will remain suspended clear of the lever, and the damper will be entirely open. If, on the other hand, there should be such an excess of pressure of steam as to raise the lever loaded by the first weight, it will, after rising a short distance, be further loaded with a second weight, and there will be a further contraction of the flue by the damper, a still further rise of the lever, resulting in the arresting of the latter by a third load and a further contraction of the flue.

The manufacturers claim every advantage that is gained by the use of other damper regulators without their disadvantages. In all other machines that have been applied to operate the damper by the action of the steam there are but two possible positions of the damper—it is either wide open or entirely closed; there must be no draught at all, or the full force. This has been the one defect that has prevented them from being thoroughly successful.

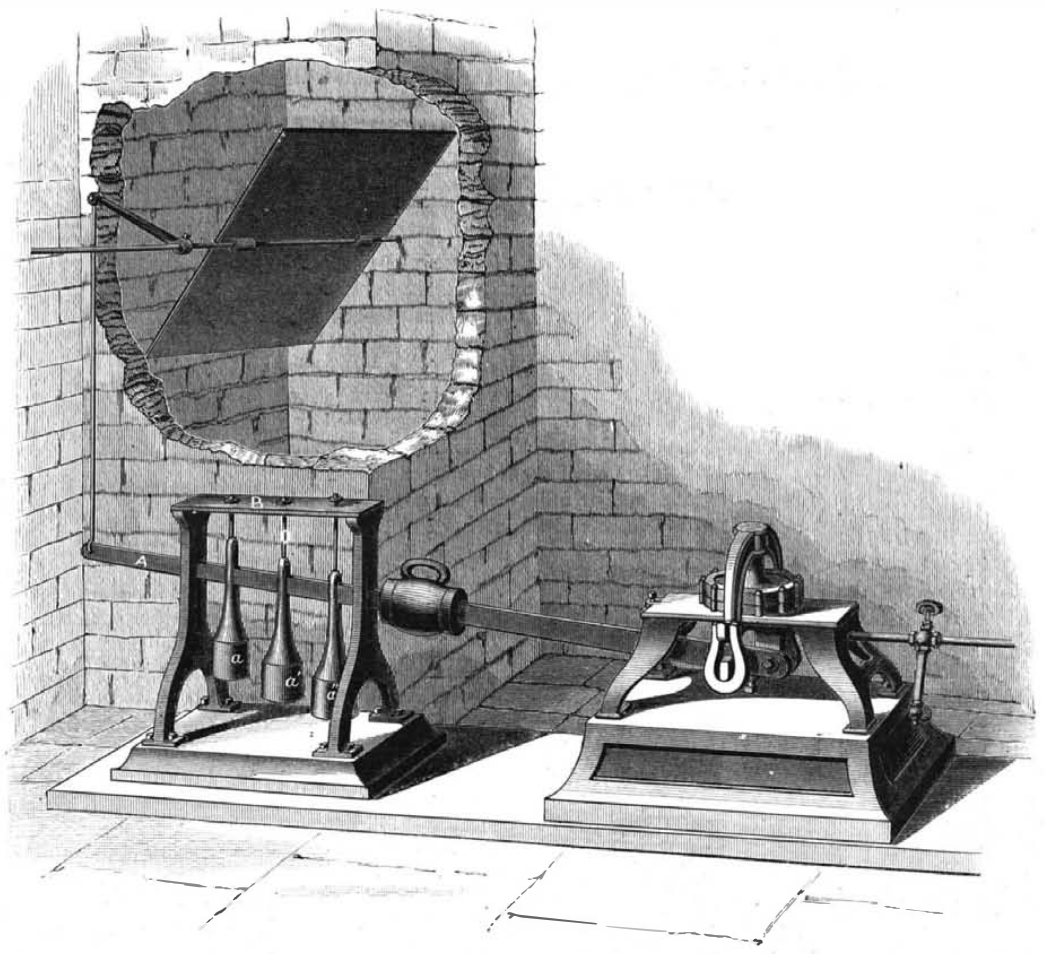
By this machine we are now able to absolutely control the working of boilers by keeping the damper always in that position which produces the normal pressure of steam, and by compensating for any rise or fall of pressure due to an irregularity in the use of steam by closing or opening the damper only as may be necessary.

Except in extreme cases, the damper is neither entirely open nor closed, but is maintained accurately in the position necessary to produce a draught corresponding to the normal working pressure.

This regulator is applicable to cases where an artificial draught is used by arranging it to regulate the motor. It must be admitted that economy of fuel is effected by having a constant uniform of draught proportioned nicely by the amount of steam it is desired to carry, which reduces the consumption of fuel to a minimum.

It is impossible for the pressure to run up rapidly, as the increasing pressures are met by a corresponding closing of the damper. In addition to these advantages a great saving of labor is effected, especially where the fireman's duty is not confined to the care of his boilers alone—the steam pressure remains practically always at a constant point, and his time, except when coaling or feeding water, can be utilized in other work.

For further information apply to Turl's Iron Works, agents, foot of West 28th street, New York city.



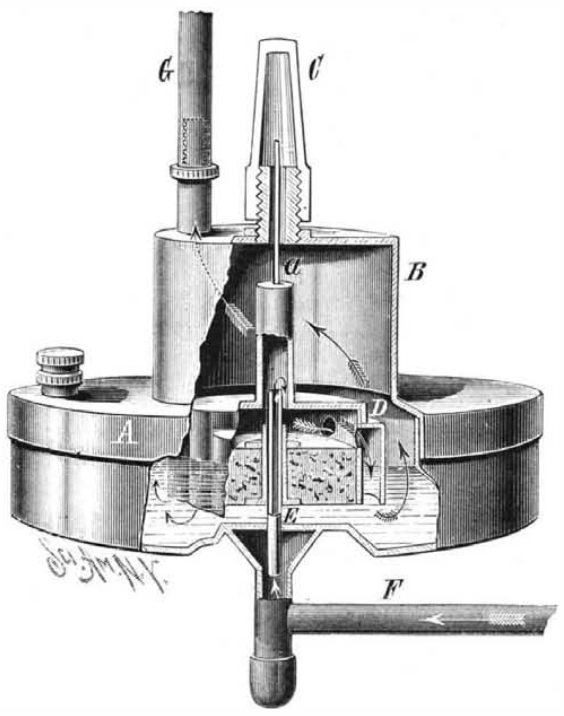
THE FRANKLIN DRAUGHT REGULATOR.

The Alaska Fisheries.

The United States coast-survey schooner Tukan sails from San Francisco, in May, for Alaska, in charge of Mr. Tarleton H. Bean, who has been directed by the Commissioner of Fisheries to make a thorough examination of the character and resources of the Alaska sea and river fisheries.

A NEW GAS ECONOMIZER.

The annexed engraving represents a novel device for enriching and economizing coal gas. It is simple and easily applied, and is said to be very efficient. On the top of the liquid-tight vessel, A, there is a dome, B, from the center of which a glass tube, C, projects. This tube is closed at the top, and at the bottom opens into the vessel, A. A float, D, having a cork bottom, slides upon a tube, E, which enters the vessel, A, at the bottom, and communicates with a pipe, F, leading from the gas meter. In the upper portion of the float there is a shallow chamber which communicates by small perforations with small vertical tubes arranged around



STRONG'S GAS ECONOMIZER.

the float. From the top of the float a needle, *a*, extends upward into the glass tube, C, and serves as an index of the movements of the float. The vessel, A, is provided with a filling tube, through which some of the lighter hydrocarbons are introduced into the vessel. The float rises and falls freely as the depth of the liquid varies in the vessel, but the weight of the float remaining the same its displacement is not affected by the quantity of liquid in the vessel, and the gas ejected into it from the float will always have the same quantity of liquid to rise through, thereby insuring uniformity in both the pressure and the quantity of gas supplied. Gas conveyed to the float through the tube, E, passes into the vertical tubes and rises up through the liquid as indicated by the arrows, and finally passes out through the tube, G, for distribution to the burners.

The gas is enriched by its passage through the hydrocarbon, and the light given by it is correspondingly increased.

This useful invention was recently patented by Mr. George T. Strong, of Port Hope, Ontario, Canada, from whom further information may be obtained.

London Fogs.

The Londoners are, as usual at this season of the year, in great tribulation over their fog. On the theory that the steam from a kettle will disperse fog in a room, a writer in the *Lancet* believes that by sending out an army of steam engines on foggy mornings about the London streets, they might produce a cloudless sky. A most telling prospectus could be made out of the advantages of blue sky over yellow fog. The name of the company, *Capital and Labor* suggests, should be the "Fog Dispersing and Blue Sky Assurance Company," and a copy of the prospectus should be particularly sent to ladies and gentlemen known to suffer from bronchial affections. An army of puffing engines would, of course, be somewhat expensive, and it may be rather irritating to be awakened, say at the hour of 4 A. M., by a chorus of steam engines, but considerations of this kind ought not to be allowed to stand in the way of the realization of an idea which is at least unique.

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The Abolition of Labor.

In an extended study of the intellectual and industrial history of mankind (in the new Australian quarterly, the *Victorian Review*), Mr. James Smith says in summing up his conclusions:

In the earlier stages of human progress the race invents, only or chiefly, such implements and machines as are supplements to, or substitutes for, or multiplications of, muscular power. This is the aim or end of mechanism, which replaces manual labor by appliances that relieve the operative, while they increase the production of desirable objects. But as the cerebral development of the higher members of the family of man proceeds, invention takes a loftier flight and finds a wider scope. By giving us the telescope, the microscope, and the spectrum, it extends the power of vision, and endows us with something like another, and with certainly a finer, sense; while the telephone, microphone, and macrophone, are an extension of the faculty of hearing; and looms of every description, sewing machines, organs and pianofortes, type setting and type writing machines, and numerous other inventions of a similar character, may be regarded as an extension of the powers of touch. Ultimately science confers upon us the electric telegraph, which may be said to be an extension of the nervous system of every one of us: inasmuch as the thought which the brain transmits with such startling rapidity to the hand that writes the telegraphic message is transmitted with equal celerity, and by a similar agency, to any part of the world; so that, strictly speaking, the nerve centers of any person in communication with this agency are linked with fibers which cover the entire surface of the civilized globe.

Hence, if I have succeeded in making my meaning clear, the industrial development of the civilized races proceeds, *pari passu*, with their cerebral development. At first man toils laboriously, with nothing to help him in procuring the means of subsistence but the clumsy strength which inheres in his uncouth limbs. Then he constructs a few implements of the rudest and most primitive character. Then he gradually improves upon these, and learns how to forge metal and to fabricate tools. Then he becomes a mechanist; then he arrives at the art of manufacturing labor-saving machinery; then the discovery of the power residing in compressed steam enables him to make enormous strides in every department of industry; and the railroad, the steamship, and the electric telegraph virtually double or treble the term of his natural life, while indefinitely augmenting his strength. And so, as the laureate sings—

"Through the ages one increasing purpose runs.
And the thoughts of men are widen'd with the process of the suns."

Meanwhile, owing to the magnitude of the productive forces which are thus brought into active operation, there is an immense augmentation of their material results, and this, we must not omit to observe, is accompanied by a steady decrease in the amount of physical exertion which is necessary to accomplish those results. In the primitive ages of the world, bulk of frame, strength of limb, strenuousness of muscle, and robustness of thew and sinew count for much, both in war and in peace—both with the hunter who subsists by the chase, and with the husbandman who, at a later epoch, tills the ground. But, as the race advances, as the brain grows, and the nervous system is quicker and more sensitive to receive impressions from the outer world and to convey directions to the sensorial organs, and as the five avenues to the mind brighten and expand, mere bulk and muscle subside into minor importance. Manual labor is superseded by mechanical appliances; the artificer rises into an artist; the operative is transformed into the intelligent supervisor of machinery, which effects more in one hour than his unaided hands could have done in a year; and the progress of invention contains within itself the prophecy of the ultimate abolition of toilsome labor, and of its replacement by those "dumb elephants" who work for us day and night, with no other food than a little coal and water, and who are so docile that the hand of a little child can control, regulate, or suspend their movements. Are we not, then, approaching the millennium of the workingman, and drawing near the time when the very phrase itself will have lost the meaning which has so long attached to it, and will be conferred, as a title of honor, upon the real workers of the race—upon men with large and beneficially active brains—statesmen, inventors, teachers, natural philosophers, original thinkers, and all who, marching ahead of their generation, hold up the lamp of progress to enlighten the path of the multitude who follow in their steps?

For some years to come, perhaps, there will be a good deal of rough work, which will have to be done by rough hands; but, in the main, I believe the stream of tendency flows in the direction of emancipating the *élite* of the wages-earning classes from laborious and exhausting toil, and of enabling them to become the superintendents of machinery, emulating, in the perfection of its operation and results, the finest workmanship of human hands.

A Comfort to Fat People.

No doubt, says the London *Lancet*, it is unpleasant to be excessively obese; but the morbid dread of fat which has in recent years become fashionable has no foundation in physiological fact. Fat answers two purposes; it acts as a non-conducting envelope for the body, and protects it from too rapid loss of heat, and it serves as a store of fuel. In the course of exhausting diseases, it not unfrequently happens that the life of a patient may be prolonged until the eserve of fat is exhausted, and then he dies of inanition. Fats supply the material of the heating process on which vitality mainly depends. In great excess it is inconvenient; but the external layings-on-of-fat is no certain measure of the internal development of adipose tissue; much less does a tendency to grow fat imply or even suggest a tendency to what is known as "fatty degeneration." It is time to speak out on this point, as the most absurd notions seem to prevail. Again, it is *not* true that special forms of food determine fat. That is an old and exploded notion. Some organisms will make fat, let them be fed on the leanest and scantiest and least saccharine descriptions of food; while others will not be "fattened" let them feed on the most "fattening" of diets. The matter is one in regard to which it is supremely desirable and politic to be natural, adapting the food taken to the requirements of health rather than substance. Simple food, sufficient exercise, and regular habits, with moderation in the use of stimulants, compose the maxim of a safe and healthy way of life.

Perseverance and Health.

We believe there is a great deal of truth and wisdom in what our excellent contemporary, the *Sanitarian*, says on the above subject: A man who inherits wealth may begin and worry through three score and ten years without any definite object. In driving, in foreign travel, in hunting and fishing, in club houses and society, he may manage to pass away his time; but he will hardly be happy. It seems to be necessary to health that the powers of a man may be trained upon some subject and steadily held there day after day, year after year, while vitality lasts. There may come a time in old age when the fund of vitality will have sunk so low that he can follow no consecutive labor without such a draught upon his forces that sleep cannot restore them. Then, and not before, he should stop work. But so long as a man has vitality to spare upon work it must be used, or it will become a source of grievous, harassing discontent. The man will not know what to do with himself; and when he has reached such a point as that, he is unconsciously digging a grave for himself, and fashioning his own coffin.

Life needs a steady channel to run in—regular habits of work and of sleep. It needs a steady, stimulating aim—a tend toward something. An aimless life can never be happy, or, for a long period, healthy. Said a rich lady to a gentleman still laboring beyond his needs: "Don't stop; keep at it." The words that were in her heart were: "If my husband had not stopped, he would be alive to-day." And what she thought was doubtless true. A greater shock can hardly befall a man who has been active than that which he experiences when, having relinquished his pursuits, he finds unused time and unused vitality hanging upon his idle hands and mind. The current of his life is thus thrown into eddies, or settled into a sluggish pool, and he begins to die.

Injurious Effects from Vulcanite Plates.

Samuel Sexton, M.D., in an article published in the *American Journal of the Medical Sciences*, for January, 1880, states that vulcanite plates produce diseases that are more frequently the source of reflex aural disease than any others worn. They have been in use for over twenty years, and their adoption is very general. The constituents of this are caoutchouc, the sulphur required in the vulcanizing process, and vermilion or the sulphide of mercury, used for the color it imparts. The quantity of the latter ingredient is believed to be equal in weight to both the other substances mentioned; accurate knowledge, however, is withheld by the manufacturers.

The gradual disintegration of these plates, as they are worn in the mouth, liberates a salt of mercury whose poisonous effects are well known. But besides yielding a poison, they are otherwise injurious to health. Inquiries from dentists elicit the fact that at least one-third of all those who attempt to wear them experience great irritation of the mouth, an irritation that is frequently accompanied by hypersecretion of the buccal fluid. The sufferer usually lays aside the plate until informed of the necessity of becoming accustomed to its presence by uninterrupted use. Vulcanite is a non-conductor of heat, and the effect of its contact with the highly sensitive tissues of the mouth is to produce hyperæmia and inflammation. Another source of injury is the very close contact of these plates, which is maintained by atmospheric pressure, and may favor the absorption of their substance.

Dirt and Bodily Heat.

The part which the skin plays in the regulation of bodily heat is not adequately estimated. The envelope of complicated structure and vital function which covers the body, and which nature has destined to perform a large share of the labor of health preserving, is practically thrown out of use by our habit of loading it with clothes. It is needless to complicate matters by allowing it to be choked and encumbered with dirt. If the skin of an animal be coated with an impervious varnish, death must ensue. A covering of dirt is only less inimical to life. We are not now speaking of dirt such as offends the sense of decency, but of those accumulations of exuded matter with which the skin must become loaded if it is habitually covered and not thoroughly cleansed. The cold bath is *not* a cleansing agent. A man may bathe daily and use his bath towel even roughly, but remain as dirty to all practical intents as though he eschewed cleanliness; indeed the physical evil of dirt is more likely to ensue, because if wholly neglected, the skin would cast off its excrementitious matter by periodic perspirations with desquamation of the cuticle. Nothing but a frequent washing in water, of at least equal temperature with the skin, and soap can insure a free and healthy surface. The feet require especial care, and it is too much the practice to neglect them. The omission of daily washings with soap and the wearing of foot coverings so tight as to compress the blood-vessels and retard the circulation of the blood through the extremities, are the most common causes of cold feet. The remedy is obvious: dress loosely and wash frequently.—*Lancet.*

Gas and Electricity.

In his recent inaugural address before the Society of Telegraph Engineers, London, President W. H. Preece said:

The electric light has been making considerable progress, and is gradually forcing itself into practical use, in spite of many of the drawbacks to its employment that have yet to be removed. The lamp of the future has not yet been produced, though steadiness and duration have very much advanced during the past twelve months. There is very little room for improvement in the generating machine, for both the Siemens and Gramme machines convert about 90 per cent of the energy thrown into them into electric currents, and this is a duty which no other kind of machine can show.

One of its most notable and useful applications has been on board ship, to further the operations during the night in laying and repairing cables. I was present on board the steamship Dacia, in the Mediterranean, when this was done, and the success was unequivocal.

The Brush machine has recently been introduced into this country, and its performances are certainly wonderful. It produces an electromotive force of over 800 volts, and I have seen it maintain 20 very steady arcs joined in series. 16 appear to be its efficient limit, and this number of lamps, giving over 1,000 candle power, are easily maintained by an expenditure of 13½ horse power. The performances of the Brush light are certainly the most advanced form the electric light has yet taken. There are over 800 of these lights in the United States; and it is worthy of notice that it has quietly crept into existence without the aid of the ubiquitous and omniscient newspaper correspondent, or the transmission of any sensational telegrams, to the detriment and discomfort of gas shareholders.

It is assumed by many that the electric light is devoid of heat, but Professor Dewar has shown that a Siemens arc radiates heat equivalent to 3 horse power per minute. Moreover, the use of such powerful currents, unless carefully directed, are dangerous to life and limb, and may even, unless properly protected, result in fire.

Gas is not going to be affected by the electric light. The proper function of gas is to generate heat. 94 per cent of the ingredients of gas are consumed in generating heat, and only 6 per cent in producing light. It is remarkable that so amenable and tractable an agent for heating purposes has not been more utilized, but the fact is that the public is ignorant of its properties, careless of its employment, and callous of its defects. It is not too much to say that 50 per cent of the gas manufactured is absolutely wasted for illuminating purposes by the wild extravagance with which it is burnt, and by the want of those systems of regulation which have been introduced to compensate for irregularities and excesses of pressure.

Feather Plush.

For some time past the ingenuity of several manufacturers has alighted upon the idea of utilizing feathers as a material for weaving fabrics in various ways. We thus saw recently two samples of feather cloth which had come from France, and which consisted, apparently, of the down of feathers interwoven with fine woolen warp, in one case throwing the feathers to one surface, and in the other laying them upon both sides; the latter, especially, was a very interesting and exceedingly light cloth, which we understand is used in France for chest protectors, and is for that purpose more agreeable, though perhaps not so durable, as flannel or felt.

From a foreign patent we see that one manufacturer has protected a machine by means of which he produces a cloth or felt, in which he mixes finely broken feathers with wool, and then cards and felts them together. The machine he uses for the purpose is a combination of the opener and scutcher as used in cotton mills, and the fur formers employed in hat works. The feathers, which may be of any cheap kind, are placed upon a feed table, whence they pass under a drum set laterally with steel knives, which break the feathers; from this drum they pass between three small rollers and a superposed fluted and chased iron roller with a to-and-fro motion endways, as well as a revolving motion, and by which the reduced feathers are ground quite small, and, falling upon a traveling apron, pass on to a spiked drum running in a cage, whose office is to reduce any pieces which have escaped the action of the rollers. The pounded feathers fall to the bottom of the machine, whence a fan sends them into a proper receptacle, where the feathers are mixed at once with wool. They may be blown direct upon the card table of a carding engine, which, in that case, must have a cover as is usual in carding cotton.

The mixture of feathers and wool can, of course, be made in any proportion. The inventor states that he has obtained the best results by felting the cloth; the laps made by the carding engines are jointed by friction under the influence of steam, then milled, dried, and subjected to the action of steam at a high temperature in a steam chamber, which latter action is said to thoroughly amalgamate the feathers and the wool.—*Textile Manufacturer.*

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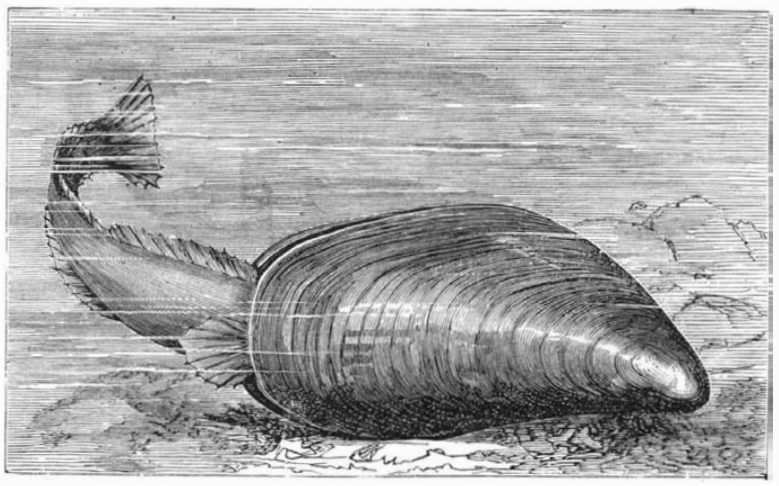
CURIOUS CAPTURE BY AN OYSTER AND A MUSSEL.

A correspondent of *Land and Water* lately forwarded to the editor of that journal a box containing a shanny and a mussel, which he describes as having been taken in the harbor at Looe, Cornwall, in exactly the position represented in the accompanying illustration. The shanny and mussel were taken by a fisherman who was gathering mussels for bait at Looe. Mussels are found in great numbers at the bottom of the harbor there, and the fishermen use a long-handled, four-pronged fork for catching them. A boat is moored over the spot on which the mussels are to be found, and the fork is employed to bring them from below into the boat. In the case in question the shanny and mussel were brought up as shown in our illustration. The fish was alive when taken, and its head firmly fixed in the mussel. This certainly may be considered a curious capture, and from the evidence it may be fairly assumed that the shanny, seeing a tempting mussel with its mouth open, was induced to pop his head in—an operation which the mussel doubtless resented by immediately closing its valves, retaining the fish in its deadly grasp.



SHANNY CAUGHT BY MUSSEL.

In the same periodical some time ago was recorded an even more extraordinary capture than the above, by Mr. Frank Buckland. We reproduce Mr. Buckland's remarks and the illustration which appeared at the time:

"Some time since, when examining the famous oyster beds at Helston, near Falmouth, Mr. Fred Hill, of Helston, was kind enough to accompany me and my friend Mr. Howard Fox, of Falmouth, in our expedition. Mr. Hill mentioned to me at the time that he had a curious specimen of a bird that had been caught by an oyster. The bird and oyster had been mounted in a case by Mr. Vingor, of Penzance. I have received from Mr. Hill a photograph of the event, which I have since had engraved. The history is that a woman who sells oysters went one morning to the Helford river and found the bird—a common rail—quite dead, with its beak held quite firmly by the oyster, which was still alive.

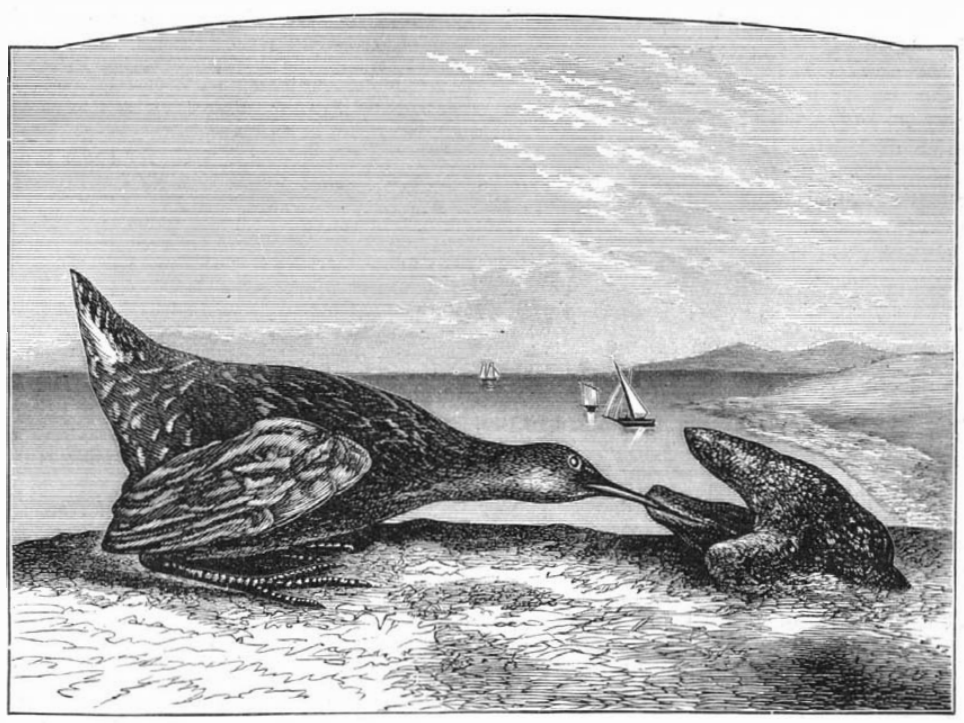
"The bird in all probability was wandering along the foreshore, looking for his dinner, and the oyster—possibly left longer by the tide than usual—was opening his shells waiting the incoming water. The hungry rail, seeing something that looked like a white and dainty bit of food, pecked at the body of the oyster, and probably pricked him sharply with his beak. The oyster then snapped his shells together as quick as a rat trap, and the poor bird instantly became a prisoner to die (or possibly get drowned as the tide rose) in his prison.

The History of Chalk Flints.

At a recent meeting of the Geological Society (England) a paper was read by Dr. Wallich, describing the origin, mode of formation, and causes of the stratification of the flints which occur in chalk. Taking as the basis of his conclusions the fact brought to notice by him in 1860, namely, that the whole of the protozoan life at the sea bed is strictly limited to the immediate surface layer of the muddy deposits, he pointed out in detail the successive stages of the flint formation, from the period when the chief portion of the silica of which they are composed was eliminated from the ocean water by the deep sea sponges, to the period when it became consolidated in layers or sheets conforming to the stratification of the chalk. In relation to this subject the author claimed to have sustained the following conclusions: 1. That the silica of flints is derived mainly from the sponge beds and sponge fields which exist in immense profusion over the areas occupied by the Globigerine or calcareous "ooze." 2. That the deep sea sponges, with their environment of protoplasmic matter, constitute by far the most important and essential factors in the production and stratification of the flints. 3. That, whereas nearly the whole of the carbonate of lime, derived partly from foraminiferaan dother organisms that have lived and died at the bottom, and partly from such as have subsided to the bottom only after death, goes to build up the calcareous stratum, nearly the whole of the silica, whether derived from the deep sea sponges or from surface protozoa, goes to form the flints. 4. That the sponges are the only really important contributors to the flint formation that live and die at the sea bed. 5. That the flints are just as much an organic product as the chalk itself. 6. That the stratification of the flint is the immediate result of all sessile protozoan life being confined to the superficial layer of the muddy deposits. 7. That the substance which received the name of "Bathybius," and was declared to be an independent living moneron, is, in reality, sponge protoplasm. 8. That no valid *lithological* distinction exists between the chalk and the calcareous mud of the Atlantic; and *pro tanto*, therefore, the calcareous mud may be, and in all probability is, a continuation of the chalk formation.

Telegraph Wires "Crossed" by Magpies.

The *Journal of the Melbourne Telegraph Electrical Society* reports a curious case of interruption which occurred recently on two of the Western lines, Australia. An intermittent "cross" (one of the most troublesome faults to detect) existed for some little time on these lines, and a close inspection was found to be necessary. This resulted in the discovery that some magpies (Australian) had actually built a nest on one of the telegraph poles, and, among other materials used in its construction, had taken all the odd pieces of tie-wire which they could find within some distance of the spot; scraps which had been thrown aside by the line repairers were twisted up together in the most singular manner, considering that they had no pliers to work with excepting their beaks. Some of these pieces of wire touched one line, and some occasionally the other, causing the "cross" complained of. It appears that lately several attempts at nest building on the part of magpies on the telegraph poles on the plains in the Western District have been discovered.



RAIL CAUGHT BY OYSTER.

The International Postage Stamp.

The *Annales Industrielles* says that France and Belgium are now making negotiations in regard to an international postage stamp. If the project is realized the payment of small sums might be made in stamps. If the plan could be made universal not only could such sums be sent from one country in payment of amounts too small to send by postal order, but stamps could be sent to prepay answers to letters, which at present is impossible.

Growth of Plants.

The free evening lecture at the Working Men's College, Great Ormond street, London, on February 21, was given by Mr. Francis Darwin, M.D., a son of the well known naturalist. The growth of a plant, the lecturer said, might be likened to the growth of a snowball set rolling down a snow-covered hillside. Both plant and snowball grew in size by the addition of matter; but while, if the bulb of a hyacinth were placed in water and kept in the dark, it would grow in the ordinary sense of the word, in reality the plant would merely have taken stuff out of the bulb and arranged it in a different way, whereas in the growth of an oak tree from an acorn a quantity of new stuff was formed. These instances of growth suggested the questions, first, how a bulb or bean rearranged its matter in forming a plant, and, secondly, how all the new material was obtained that went to form a tree? He intended on that occasion to speak of only one half of the question: How the plant in growing arranged its material? First, it was necessary to know what a plant was made of. If 100 lb. weight of some growing plant were taken, say turnips, and the water driven off by drying, it will be found that the weight would have decreased by 90 lb., and that the solid, woody part remaining, about 10 lb. in weight, would nearly all burn away, leaving but a few ashes. In order to give some idea of the way in which this large quantity of water was held in the plant, Dr. Darwin compared the effect of water on dead matter, such as tea leaves or leather, with the effect of giving water to a growing plant—the stiff, dry tea leaves became limp and soft, while the drooping, flaccid stem of a living plant, when watered, became stiff and elastic. How could the plant build up a strong, stiff stem with so much of so unstable a material as water, and how did the water become a source of strength to the plant? To understand this they must know how the water was contained in the plant. The solid material was formed into little cavities, and these—an infinite number of little boxes, as it might be—were filled with water. The way in which the water might become a source of strength could be seen by forcing water into a flexible tube or bladder, or by blowing air into an empty glove. The pressure of the water contained within caused the walls of the cells to become stiff. There were other ways, too, in which this stiffness was obtained, the water getting into the texture of the woody stuff and stiffening it as water stiffened sailcloth. This state of things existed also in the pith, and each cell, being over-filled with water, was for ever trying to lengthen itself. Some of the results of these conditions in the plant were then explained by the use of two pieces of spiral spring, and for a more familiar example the audience were referred to the effect of splitting a dandelion stem. Each half curled over outward because the more elastic pith, trying to lengthen itself, was prevented from expanding on one side by the less elastic bark. With two pieces of spiral spring in a linen tube it was next explained how, when the pressure of water in the cells in the two halves of the pith was not equal, the stem did not grow straight. Not that plants bent accidentally or in a purposeless manner. On the contrary, when the plant bent it was with some distinct and useful object. To the explanation of this point, the rest of the lecture was directed. The directions and forms which the root and stem of a young growing plant might take were happily illustrated with a piece of whitened lead pipe of small bore put through a cork, which did duty for the bean. A great many theories had been offered to account for the fact that the root always tried to grow towards, and the stem away from the center of earth. Having related Andrew Knight's ingenious experiment with a revolving wheel, by which, with centrifugal force as a substitute for gravity, the plant was deceived and the direction of growth in seedlings was changed, the lecturer next dealt with the influence of light and damp on the growth of a plant. The stem was invariably shot out or bent aside in order to get at the light; and the root, with equal persistency and certainty, was sent to find moisture. It would have been noticed, Mr. Darwin said in conclusion, that he had, throughout, spoken of plants perceiving the light, and knowing where the center of the earth was, and had used other expressions of a similar kind, usually only applied to animals. He had done so with no idea of being paradoxical, but because he thought that by thinking of plants in this way we were more likely to learn what was going on within them. If we would understand the actions of an animal, we must know what was useful or not useful for that life, and it was quite as necessary to consider in the life of a plant of what use its actions were, and, in a certain sense, why it acted in a particular way.

ADVANCE IN THE PRICE OF DIRT.—In consequence of the rise in the prices of rags and other fibers, the price of South Carolina clay, used by paper makers to increase the weight of their goods, has lately been advanced two dollars per ton.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

Wanted—Two Machinists that are good on general jobbing. Address H. Gillett & Son, Lake City, Wabasha Co., Minn.

Poirrier's Anilines and Copying Composition. Copygram Co., 104 Duane St., N. Y. See adv. p. 220, last No.

For manufacturing sites, coke and gas coal lands, their qualities and prices, address Mellon Brothers, Pittsburg, Pa.

Mackenzie Cupola and Blower. The very best apparatus for melting iron; and with water bosh for smelting lead, silver, or copper ores. Send for pamphlet. Smith & Sayre Manuf. Co., 21 Courtlandt St., New York.

Backus Water Motor, 30 in. double, nearly new; for sale low. Gould & Eberhardt, Newark, N. J.

Penfield (Pulley) Block Works. See illus. adv. p. 220.

LAKE VIEW HOUSE, LIVONIA, N. Y., Feb. 9, 1880:
H. W. Johns Mfg. Co., 87 Maiden Lane, New York.
DEAR SIRS. We have used your Paint on our buildings, and find one coat goes as far and covers as well as two coats of lead and oil.
Yours truly, E. R. BOLLES.

$60 saved in one day on one engine by an intelligent use of the Indicator. See Lyman's Treatise on "The Use of the Steam Engine Indicator." Price $1. Address Edward Lyman, C.E., New Haven, Conn.

Will pay $25 for best article on Acoustic Telephones and Lines. Must be plain to ordinary readers, illustrated with plans, etc. Rejected MSS. returned. Good suggestions credited. Address "Teachers' Guide," Mallet Creek, Ohio.

For Standard Turbine, see last or next number.

Foundry and Machine Shops for sale. Established in 1846. Write for description to E. J. Hoen, Addison, Steuben Co., N. Y

Recipe for sale for making a superior deep black Shoe Polish, without acids, etc. Address C. F. Doring, Troy, N. Y.

4 to 40 H. P. Steam Engines. See adv. p. 220.

The 1880 Pennsylvania Lawn Mower.—Light draught and easily adjusted. Machines warranted. See illus. adv. last week. Lloyd, Supplee & Walton, Philadelphia, Pa.

Wanted—Glass and Tin Fruit Cans; large quantities. Send price lists to E., Buff Bay, Jamaica, West Indies.

All kinds Machine Drawings. Inventors' work a specialty. Hours, 9 to 6. Wm. D. Skidmore, 733 Broadway, New York.

Brass Castings; bottom prices. H.B. Morris, Ithaca, N.Y.

For Alcott's Improved Turbine, see adv. p. 204.

Boiler Feed Pump, with tight and loose pulleys; sure to work. Price $32. York & Smith, Cleveland, O.

For Sale.—An Agricultural Establishment, consisting of two story wood & machine shop, foundry, office, & storeroom; water power. Address Box "I," Weldon. N.C.

Boat Engines, for sidewheel boats drawing 6 to 12 in; direct acting; link motion; cheap. Box 559, Owego, N.Y.

For Sale.—Four Boilers, 100 horse power each, return drop flue; A 1 condition; $1,500 each. 1 Berryman Heater, 42 x 96; A 1 condition; $400. D. L. Einstein, 16 White St., New York.

Corrugated Traction Tire for Portable Engines, etc. Sole manufacturers, H. Lloyd, Son & Co., Pittsburg, Pa.

For Patent Shapers and Planers, see ills. adv. p. 188.

Spokes and Rims, white oak and hickory, best quality, to any pattern, and Hammer Handles of best hickory. John Fitz, Martinsburg, West Va.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

Collection of Ornaments.—A book containing over 1,000 different designs, such as crests, coats of arms, vignettes, scrolls, corners, borders, etc., sent on receipt of $2. Palm & Fechteler, 403 Broadway, New York city.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Sheet Metal Presses. Ferracute Co., Bridgeton, N. J.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Bradley's cushioned helve hammers. See illus. ad. p. 205.

Forsaith & Co., Manchester, N. H., & 213 Centre St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

Electrical Indicators for giving signal notice of extremes of pressure or temperature. Costs only $20. Attached to any instrument. T. Shaw, 915 Ridge Ave. Phila.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

Portable Forges, $12. Roberts, 107 Liberty St., N. Y.

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 188.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Large knife work a specialty. Also manufacturers of Soloman's Parallel Vise. Taylor, Stiles & Co., Riegelsville, N. J.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 188.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Company, Buffalo, N. Y.

Wanted—A Second-hand improved Country Campbell Press, 31 x 46, for $500 cash. A. G. Blair, Waynesboro, Franklin Co., Pa.

Machine Diamonds, J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For Wood-Working Machinery, see illus. adv. p. 221.

Wanted—The address of 40,000 Sawyers and Lumbermen for a copy of Emerson's Hand Book of Saws. New edition 1880. Over 100 illustrations and pages of valuable information. Emerson, Smith & Co., Beaver Falls, Pa.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 189.

Eclipse Portable Engine. See illustrated adv., p. 222.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus'd adv. p. 62.

Eagle Anvils, 9 cents per pound. Fully warranted.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N. Y.

For Separators, Farm & Vertical Engines, see adv. p. 188.

Best Turkey Emery in kegs, half kegs, and cans; liberal rates by the ton. Greene, Tweed & Co., N. Y.

Blake's Belt Studs. The best and cheapest fastening for rubber and leather belts. Greene, Tweed & Co., N. Y.

The Horton Lathe Chucks; prices reduced 25 per cent. Address The E. Horton & Son Co., Windsor Locks, Conn.

$275 Horizontal Engine, 20 H. P. See page 221.

Emery Wheels of all kinds, and Machines at reduced prices. Lehigh Valley Emery Wheel Co., Weissport, Pa.

For Sale.—Two Windmill Patents, and set of patterns for same. None better. F. C. Maxwell, Columbus, O.

Judson's Sectional Assay Furnaces. No. 1, $45; No. 2, $60. W. E. Judson, Cleveland, O.

Pat. Steam Hoisting Mach'y. See illus. adv., p. 221.

Nellis' Cast Tool Steel, Castings from which our specialty is Plow Shares. Also all kinds agricultural steels and ornamental fencings. Nellis, Shriver & Co., Pittsburg, Pa.

Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Circulars on application. Pittsburg Steel Casting Company, Pittsburg, Pa.

Self-feeding Upright Hand Drilling Machines of superior construction. Pratt & Whitney Co., Hartford, Ct.

Rue's New "Little Giant" Injector is much praised or its capacity, reliability, and long use without repairs. Rue Manufacturing Co., Philadelphia, Pa.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

For Middlings, Mill and Mill Furnishing, see adv. p. 222.

Elevators.—Stokes & Parrish, Phila., Pa. See p. 221.

NEW BOOKS AND PUBLICATIONS.

DIRECTORY OF THE FLOUR MILL OWNERS AND MILLWRIGHTS OF THE UNITED STATES AND CANADA, 1880. Milwaukee, Wis.: E. Harrison Cawker, editor *U. S. Miller*.

Business men having or desiring trade with millers and millwrights will appreciate the value of a list of names with post office addresses covering so fully the great flouring industry. The book shows a marked improvement on the former directory in size and fullness of information.

ANUARIO UNIVERSAL. Almaque Estadistico, Administrativo y Comercial para 1880. Mexico: Filomento Mata, editor. 32mo, cloth, pp. 408.

Well filled with information in relation to the governmental, social, and commercial affairs of the State of Mexico, with a plan of the capital etc.

SEWERS AND DRAINS FOR POPULOUS DISTRICTS; WITH RULES AND FORMULÆ FOR THE DETERMINATION OF THEIR DIMENSIONS UNDER ALL CIRCUMSTANCES. By Julius W. Adams. Illustrated. New York: D. Van Nostrand, 8vo. cloth, pp. 228.

In 1857 Mr. Adams was charged with the planning of the sewage system of the city of Brooklyn, covering an area of twenty square miles; and as chief engineer of the Board of City Works he has taken a controlling part in the development of the great work. The constant inquiry for detailed information in regard to the system pursued has led to the preparation of this volume, in which he lays down the principles and describes the methods which he believes to be best adapted to the economical and successful sewering of towns and cities. The work is eminently practical and to the point.

SAWS: THE HISTORY, DEVELOPMENT, ACTION CLASSIFICATION, AND COMPARISON OF SAWS OF ALL KINDS. By Robert Grimshaw, Ph.D. Philadelphia: Claxton, Remsen & Haffelfinger. Quarto, cloth. pp. 160. Price $2.50.

Reserving sawing machines for another treatise, Mr. Grimshaw here describes with great fullness and with a profusion of illustrations, the saw blade, in all its varieties. The manufacture of saws and the various processes of setting, swaging, gumming, and filing of saws, and related matters are treated in appendices, which contain also many useful tables of gauges, log measurements, etc., and an alphabetical list of all United States saw patents from 1790 to 1880. The book is handsomely made and well indexed.

FREE SHIPS. By John Codman. New York: G. P. Putnam's Sons. Pp. 54, paper. Price 25 cents.

Second edition of No. VI. of Putnam's Economic Monographs. Adds to the original arguments for the restoration of the American carrying trade by the free importation of ships, a review of the plans of Senator Blaine and Secretary Sherman.

A MANUAL OF TOBACCO CULTURE. By R. B. Davis. Hickory, North Carolina: Hall Brothers. Paper, pp. 30. Gratis.

Sets forth the advantages of the Piedmont section of North Carolina for the production of yellow tobacco, and treats the cultivation and curing of the tobacco plant with special reference to the condition and requirements of Piedmont.

SAWYER'S HAND BOOK.

Emerson Smith & Co., extensive saw manufacturers at Beaver Falls, Pa., have issued an attractive hand book, in which they not only tell the public where to purchase saws, but the book also contains many useful hints on saw mills and machinery, how to straighten saws, their proper speed, prevention of heating, etc.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) W. E. asks: Is the apex of the zodiacal light in the same direction from the sun as the aphelion point of the earth's orbit? A. The zodiacal light extends out on each side of the sun nearly in the plane of the ecliptic.

(2) W. B. asks: 1. Is there an odorless coal oil in the market? A. No. 2. What chemical will dissolve old rubber boots? A. There is no practical solvent. See pp. 48 and 105, Vol. 39, SCIENTIFIC AMERICAN.

(3) F. A. P. asks: Is there anything that printers use to put in their ink, vermilion, lake, or black, for instance, which will give a lasting gloss? If so, what is it and how is it used? A. Use a fine, well mulled ink. We know of nothing that will impart greater gloss to ink used in type work.

(4) L. F. T. asks how to make an imitation of ground glass by the use of acids or some inexpensive material other than machinery. A. The sand blast or wheel is the cheapest method of frosting glass. The only acid that can practically be applied is hydrofluoric, produced by the action of warm sulphuric acid on powdered fluorspar. Hydrofluoric acid in gutta-percha bottles is quoted at $2.50 a pound in New York.

(5) A. J. P. writes: I wish for some process of duplicating writing by which I may secure more copies—say 500—and more distinct than by the new gelatine pad process; also an apparatus not so expensive as the electric pen or the papyrograph, which cost, I believe, $35 or $40. I wish something as cheap as the first, and effective as the last. I see no reason why the latter might not be afforded for $5.00. A. Try the following: Use the gelatine pad made with a large proportion of glue. Soak writing paper in alum water to saturation and dry carefully. Write with any ink on the prepared paper and use as in the gelatine pad process; the parts of the gelatine surface not protected by the ink will be affected by the alum so as to leave a stencil which can be used by inking with a roller as in the electric pen process.

(6) S. A. asks (1) whether it is advisable to build a cistern under the basement of a dwelling house. The architect of the building insists that it should be under the building; other parties contend that it will prove injurious to the health of the inmates, on account of condensed air in cistern. We would like your opinion on the subject. A. We do not advise placing the cistern under the house as proposed. 2. What are the proportions of the best concrete? A. 5 parts gravel or sharp sand, 1 part ground quicklime (fresh). Mix with a shovel, and slake with water into a thick mortar.

(7) R. G. asks: 1. Does the velocity of a projectile from a gun outside the gun ever exceed the highest velocity inside the gun? A. No. 2. Or another phase of the same principle: does a ball thrown from the hand ever travel more rapidly than the hand in throwing it? A. Possibly yes, as the muscles of the fingers give an impulse to the ball.

(8) E. L. K. asks if there is a mixture of any kind that will remove old paint from wagon bodies? A. There is no mixture that will remove the paint successfully and leave the wood in good condition to repaint. It is a better plan to soften the paint by heat from a hot iron, or alcohol or gas flame held near it, and then scrape it off with a suitable knife or chisel.

(9) W. R. H. asks: 1. Should steel for permanent magnets be hardened? If so, what temper is best? A. The steel should be hardened and drawn to a deep yellow. 2. Where can I find information on minor details of construction of both permanent and electro-magnets? A. In SUPPLEMENTS 142, Telephones; and 182, Electromagnets.

(10) F. E. G. asks (1) for dimensions for a boiler of an engine 1 inch by 2 inches. A. About six square feet heating surface. 2. What should be the thickness of plates of copper and iron for such a boiler? A. Thickness depends upon diameter of the boiler. 3. What would be pressure to the square inch to raise a valve ½ inch in diameter and center of valve 1 inch from fulcrum, and lever 6 inches long, and weight 3 lb. on end? A. 106 lb. per square inch nearly.

(11) F. W. S. asks if there is any method of deadening the noise of presses by any substance that could be placed under the feet of the machines. I run two presses, an 8 Gordon and an Acme cylinder, in the second story of a brick building, and the jar and noise is annoying to tenants on the floor underneath. A. We think if the frames of the presses were set on pieces of thick india rubber, and the floor deadened in any of the usual modes, the presses would cease to be a nuisance.

(12) R. K. asks: When does a stationary engine runs backward or forward, or, in other words, which way does an engine run when the balance wheel runs from the cylinder or power? A. If the top of the balance wheel runs from the cylinder, the engine runs forward.

(13) W. R. W. asks: 1. When and where was the ship known as the Three Brothers (formerly the Vanderbilt) built, and who was her first captain? A. 1856, at Greenpoint, L. I., Captain Le Fevre. 2. What is her tonnage, and is she the largest sailing vessel now existing? A. 3,360 tons; the largest American sailing ship, but we believe there is a larger English ship.

(14) W. T. asks: 1. Can I separate the albumen from ordinarily albumenized paper after a photo has been printed on it, so as to leave a temporary film, to be fixed to glass? If so, how? A. We know of no satisfactory way of doing this. Try the following: Slightly coat the face with a thin negative varnish, press the print down smoothly on the glass, and, when the varnish has hardened, thoroughly moisten the paper with hot water, and carefully detach the paper. A little ammonia may be used with the water. It is better to print the photograph directly on the gelatin coated glass. 2. What colors could I use (water or oil) for lantern slides? What pigment and how mixed? A. The available pigments are Prussian blue, gamboge, carmine, verdigris, madder brown, indigo, crimson lake, raw and burnt sienna, cappah brown, and vandyke brown. The aniline or coal tar dyes are also used, but, unfortunately, they are apt to fade. No particular method of mixing the colors is requisite; ordinary oil or water colors will do, but they must be ground extremely fine. The pencils must be small, and their points unexceptionable. Camel's hair is preferable. The best vehicle to use for thinning out the colors is ordinary megilp, and the smallest possible quantity only of this should be used; if excess is used, the colors will run. The best medium for laying on the first wash of color is a hot solution of isinglass. If the lime light is to be used the colors should approximate as nearly as possible to nature. Lamp and ordinary gas light is deficient in blue, the yellow preponderating; where these are used the tints must be arranged accordingly; greens must be bluer than natural, yellows inclined to orange, and all shades of violet eschewed. Consult Groom's "Transparent Printing on Glass." 3. How are the sheets of paper prepared for ordinary transfers, and what is the dull film on the face side? A. The pictures are printed on paper heavily sized with gum, the face being also gummed.

(15) J. A. E. asks: How can the rattling or bubbling of a kitchen or hot water boiler be prevented or remedied? I have one that is piped with ¾ inch pipe, with 9 feet of pipe in the stove, with three return bends. A. When a coil is used in a stove instead of a water-back the diameter of the pipe should not exceed a certain proportion to its length, with the fewest possible turns, that the water as it warms can pass rapidly to the tank or boiler, and not be retained long enough in the coil to form steam or to get nearly as hot as it is possible, consequent with the pressure. Thus, short pipe, large diameter, with one bend, or water back with one ceptum, or if a chamber only, the water will take care of itself, according to gravity. Bubbling will be sometimes caused in a very hot tank when the pressure is relieved by drawing, on the same principle as water below 212° boils in a partial vacuum.

(16) E. R. asks how to deaden the noise of a foot lathe, so that it will not be heard in the rooms below. A. We take the following from the *Workshop Companion*: 1. Rubber cushions under the legs of the work bench. *Chambers' Journal* describes a factory where the hammering of fifty copper-smiths was scarcely audible in the room below, their benches having under each leg a rubber cushion. 2. Kegs of sand or sawdust applied in the same way. A few inches of sand or sawdust is first poured into each keg; on this is laid a board or block upon which the leg rests, and around the leg and block is poured fine dry sand or sawdust. Not only all noise, but all vibration and shock are prevented; and an ordinary anvil, so mounted, may be used in a dwelling house without annoying the inhabitants. To amateurs, whose workshops are usually located in dwelling houses, this device affords a cheap and simple relief from a very great annoyance.

(17) F. J. B. writes: I have some large Mata stone vases, with ornaments broken off in transportation, and for replacing need a nearly colorless and quickly setting cement that can be applied without heat, and that will stand outside weather if possible. Can liquid glass or white glue be prepared so as to answer the purpose? A. Try the following: Finely scraped old cheese, 1½ parts; quicklime in fine powder, 1 part; mix thoroughly, moisten with milk to a paste, and use at once, as it hardens very quickly. Instead of milk a strong aqueous solution of water glass or borax may be used. White lead (in oil) applied on cotton gauze may also be used advantageously.

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(18) C. W. C. writes: I am fixing up a small mill to grind feed for my stock. It has a pair of sixteen inch burrs which run vertically, to be driven by a common 8 or 10 horse power with a 5½ or 6 inch belt over a 10 inch pulley. What should be the length of the belt? A. We think the driving and the driven shafts should not be less than 12 feet apart.

(19) A. B. writes: I wish to make some mirrors, will you give me formula for depositing the silver? Have tried carefully the Siemens method described in SUPPLEMENT No. 105, but do not succeed. What is the trouble? A. You have probably neglected to clean your glass properly, or your aldehyde ammonia was not right. Try again, or use Chapman's process.

(20) J. J. C. writes: In receipt for cements in No. 9, current volume, you mention fresh beaten blood, etc., for Chinese cement; what kind of blood shall I use? A. Use such as may be obtained at slaughter houses. Beat it with an egg beater.

(21) G. B. writes: Some three weeks ago the town council engaged a man to dig a well for the public. He agreed to dig a 5 feet in diameter well for $2 a foot in depth; owing to the nature of the ground he had to increase the diameter to 7 feet, which the council said they would receive, and pay him in proportion of above agreement. A dispute has now begun as to what it should be—the council say $98, and his mathematicians say $137.20. Who is right? A. The relative amount of earth removed will be as the square of two diameters; if the price for 5 feet diameter was $2.00 per foot, then for 7 feet diameter it would be as the square of 5 to the square of 7 or as 25 to 49—

49
200
25)9800
$ 392×35 per foot and
3·92×35 feet=$137.20

(22) J. W. writes: Please give an easy and practical method of setting a locomotive engine eccentric while on the road in case it should slip. A. If the position of the eccentric on the shaft is marked, as it should be, you have only to set the eccentric to the marks and fasten; if not marked, place the crank on the proper center, throw the valve gear into its proper position, and turn the eccentric around till the cylinder takes steam freely, and fasten. Whether you turn the eccentric forward or back, will depend upon whether it is the go-ahead or the backing eccentric.

(23) E. De N. asks: Will a crooked pipe of the same size and length, having same pressure (for water head), pass as much water as a straight pipe would? A. No: every bend you make reduces the quantity delivered.

(24) A. S. D. asks: Do the steamboat inspection laws prohibit the use of portable boilers in small steamboats, such as small ferry boats, when the boiler is made of lawful iron and the tubes put close together as they are in portable sawmill boilers? A. They do not.

(25) F. A. writes: In answer to A. W. H. (7), of February 14, 1880, No. (7), I would say that I obtained a fair copy from an electrotype by means of the gelatin pad by saturating a cloth pad with the ink, then pressing it on the electrotype, and, when dry, placing the same face down on the pad. If A. W. H. has a better method I will be obliged to him for instructions.

(26) J. W. C. asks: 1. Is tool steel better than machinery steel for magnets? A. Tool steel hardened and drawn to a yellow makes a good magnet if properly charged. 2. Will the Calland battery answer as well as a Bunsen battery for a telephone? If not, why? A. Either will answer, but the Leclanche is considered the best battery for this purpose.

(27) R. H. G. asks: 1. What holds the smooth surfaces together that Professor Tyndall speaks of as being held as well in vacuo as in the open air? A. The force of adhesion. 2. Also of what is celluloid made? A. See p. 335, Vol. 39, SCIENTIFIC AMERICAN, query 46.

(28) M. J. L. asks: 1. What size should a boiler be (light as can be made) to raise and hold two or three pounds of steam, to run an engine not exceeding one horse power? A. To run a one horse power engine, it should have 12 to 15 feet fire surface. The thickness of metal may be 1-16 inch if the boiler is cylindrical. 2. How could the steam be gauged with perfect safety? A. Use both a pressure gauge and a safety valve, or if the pressure is not more than three or four lb. you can use a column of water as a safety valve.

(29) S. A. G. asks: 1. What makes the mark on sawed lumber. Does each tooth make a mark when a circular saw is used? A. If the teeth are evenly set, each tooth will make its own mark; but if not, some one projecting tooth will mark more distinctly than the others. 2. What would be the power required to run a boat 60 feet long and 20 feet wide—size of cylinders and boilers? A. For a stern wheel boat 66 feet by 20 feet wide, 2 engines, 10 inch cylinder and 30 inch stroke; one flue boiler 46 or 48 inches diameter and 18 feet long.

(30) C. B. G. asks: What is the best fire escape from a third or fourth story window that a lady could manage and carry in her trunk, and where could I get it? A. We think there is nothing better than a good strong knotted rope.

(31) P. A. H. asks how to make a strong battery out of a new pile Leclanche battery. A. The elements of Leclanche battery are not suitable for any other form. If you wish to make a strong battery see directions given in SUPPLEMENTS, No. 157, 158, and 159.

(32) R. E. M. writes: We have two saws, one 54 inches in diameter, the other 60 inches diameter. Now, if both run at the same speed, which will consume the most power in doing the same work? Both saws are alike in all respects but as mentioned. A. The larger one.

(33) E. J. C. asks: 1. Can I construct an induction coil of No. 36 wire and No. 16 or No. 24 wire? I have these sizes on hand. A. For a large induction coil, No. 16 will do for the primary and No. 36 for the secondary. For small coils, use four or five layers of No. 18 or No. 20 for primary and No. 36 for secondary. 2. What size wire is generally used in sounders? I find 24 too large. A. Nos. 20 to 24 are used for local sounders, and for main line sounders Nos. 24 to 32, and in some cases wire as fine as No. 36 is used. The size depends entirely on the length or resistance of the circuit in which the instruments are used. 3. I constructed a telephone as shown in SUPPLEMENT, 142, Vol. 6, Fig. 4. It does not work as well as it should. Is it an exact representation of the Bell telephone? A. It is on the principle of the Bell telephone, and should work well if constructed according to the direction referred to.

(34) C. W. N. asks: How much will a ⅝ inch wire cable chain support? A. If you mean ⅝ inch diameter wire rope, about 14,000 lb.; if you mean chain of ⅝ inch diameter wire, about 26,500 lb. A safe working load is but one-fourth or one-fifth these weights.

(35) C. W. W. writes: A mechanical engineer of high standing claims that a pump will not draw water as high by running the pipe in a curve over a knoll as it would raise it vertically. As a proof of his assertion he states that it had been tried with a pump in good condition, to draw water out of a canal the bank of which was twenty-one feet eight inches above the level of the water. The pump was located about two hundred feet from where the pipe entered the canal. I claim that the pump or pipe must have been defective, as the only difference a curve would make would be what little additional friction the increased length of pipe, due to the curve, would have over a vertical lift equal to the highest point of the curve. I would state that the pipe in question was large enough to supply the pump under any condition. A. The curve makes no difference in the height the pump can lift, save only the increased friction, but the pipes must be tight; with the curved pipe as described, it is really a siphon in form, and if there be the slightest air leak, the air will collect at the top of the curve and thus stop the action of the pump. There should be a cock or valve at the highest point to let off the air.

(36) W. H. M. asks: 1. What are the requisite qualifications to become a locomotive fireman? A. Activity, faithfulness, sobriety, close observation, and a cool head. 2. Who are the proper persons to apply to for a situation? I don't think it is the master mechanic, as I have written to several and have received no answer. A. The master mechanic or superintendent. 3. In link motion, is it necessary for every hanger to be a little above or below the central line of motion? Will it not work just as efficient by being exactly upon the line of motion? A. It depends upon the proportion of the parts. 4. Which is the accepted mode of firing a locomotive boiler? A. There is no accepted mode, as the treatment differs with different fuel and different service; the best mode with any particular fuel and service is the result of experience.

(37) W. T. S. asks (1) whether 12 ⅝ inch stay bolts are sufficient to stay the top sheet of a fire box 24x42 inch; one end of the bolts are turned into an eye, the other end running through a clevis with a nut on, steam pressure to be 120 lb. per square inch. A. No; you should have at least 30 stays, ¾ inch or ⅞ inch diameter. 2. Would there be any objection in using steam from two boilers, by running a steam pipe from the smaller boiler into the larger one, running the pump on the smaller boiler to supply it with water? A. No.

(38) S. F. A. writes: We have a difference of opinion in the shop (U. P. R. R. machine shop) in regard to how a key should be fitted in a driving wheel. One party claims that the key should be fitted to bear the hardest, top and bottom; and the other party claims that it should be fitted to bear the hardest on the sides. A. The key should be a close fit at the sides, but have no draught; all the draught should be on top and bottom.

(39) W. H. D. asks how in using a "Richards" indicator for taking diagrams from steam engines, one is sure to have the proper spring inserted in the instrument. The indicator lent me has several springs all stamped with different numbers, which to an amateur like myself are very puzzling. I want to take diagrams from different engines, under varying pressures of steam, say with 20, 30, 40, 50 lb., and up to 100 lb. pressure in the boiler. I suppose I must change the springs for each rise or fall in pressure I work at, as the springs indicate such a course from some being stronger than others; 40 to 50 lb. will probably be what I will use most. A. The numbers on the springs are the number of pounds one inch in height of the cards made with that spring will represent. If you are using, say a spring marked 40, then in marking off the card, you will divide each inch in height into 40 parts, each part being one pound per square inch, and so with a spring marked 20, divide each inch into 20 parts, etc. There should be with the indicator a scale corresponding to each spring and marked 20 scale, or 30 scale, or 40 scale; these scales are to be used in measuring a card made by a corresponding spring.

(40) E. E. K. asks: 1. What is the weight of an ordinary locomotive without tender? A. For passenger engines 50,000 to 70,000 lb., for freight engines 70,000 to 80,000 lb. 2. What is the weight of the tender? A. Depends upon their capacity. 3. What proportion of the locomotive rests on the drive wheels? A. In passenger engines about two-thirds, in freight engines from four-fifths to the whole. 4. Is there any device in use to prevent drive wheels from slipping, outside of the use of sand? A. None successful that we are aware of.

(41) D. L. writes: I wish to locate two hydraulic rams to work together; the fall is 10 feet, and length of entry pipes 25 feet. The water is to be raised 80 feet through a pipe 1,000 feet long. Will they raise the same quantity of water through a tube of 2 inches diameter as through one of 1 inch diameter (outlet tube of course)? Would the rams work successfully in case the tube were 4 inches diameter? A. The rams will operate better through a 2 inch than a 1 inch pipe. No objection to the pipe being 4 inches diameter.

(42) H. S. asks: 1. What pressure will mercury flasks bear for a steam boiler, as in SUPPLEMENT, No. 182? A. We do not know the test to which mercury flasks are submitted; but they will undoubtedly bear ten times the pressure usually carried on steam boilers. 2. How many flasks, and what size cylinder and propeller would it require for a Sharpie 26 feet long, 6½ foot beam, to go eight to ten miles per hour? A. 20 flasks submitted to the fire, and 4 or 6 for steam reservoir; engine 4 inch by 4 inch stroke; propeller 24 or 26 inches diameter, and 33 to 38 inches pitch.

(43) P. H. asks: 1. Should in the speed of circular saws there be any difference for a cross cut and a rip saw? A. No difference of speed between a cross cut and rip saw. 2. What should be the speed of the cylinder of a planer (surfacer), and what the feed for soft wood work, such as general mill work, and what for hard wood work, such as furniture? A. For a planer, about 800 revolutions per minute; the feed must depend upon the character of the wood and condition of the knives. 3. What is the proper speed of a band and what for a scroll saw? A. Speed of band saw 6,000 feet per minute; speed of scroll saw if well constructed and balanced, from 800 to 1,000 strokes per minute.

(44) J. C. B. asks: Can you give me any remedy that will drive off or kill water bugs? Our house is becoming infested with them. A. Persian insect powder thoroughly blown into all the crevices at the wall, around the water pipes, and around range will generally dislodge and kill them. The powder should be applied once a week for three or four weeks.

(45) J. G. S. asks: Can you tell me through the SCIENTIFIC AMERICAN how I can copper plate or silver plate small brass articles without a battery, or how to make a battery and liquid to do it as cheaply as possible? A. You will find on p. 409 (15), Vol. 40, of SCIENTIFIC AMERICAN, directions for making a silvering solution to be applied with a cloth, and on p. 219 (43), same vol., there are directions for coppering castings.

(46) J. S. B. writes: In your issue of March 20, under "Notes and Queries," your correspondent, B. S. (19) complains of the wasting away of copying pad in cleaning after use. There is no necessity for cleaning off the impression. If the pad is laid aside for 24 hours it will be found that the ink has been entirely absorbed, and a perfectly clear surface is left for another copy.

(47) S. B. G. asks: 1. Why was Cleopatra's monolith named a needle? A. Slender rock columns, whether natural or artificial, are commonly called "needles." 2. Has Cleopatra's needle reached New York yet? A. No. 3. In what part of the city will it be set up? A. Not decided. 4. Does the Cassiquiari River in Brazil always flow in the same direction? A. No.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

G. W. G.—Nickeliferous pyrrhotine—worth an analysis.—J. M.—Quartz, with sulphide of iron—not valuable.—J. W. K.—Magnetite—magnetic oxide of iron—in gneiss rock.—J. B. G.—It is quartz rock—of no value.

COMMUNICATIONS RECEIVED.

Report of Weekly Meeting of Polytechnic Association.

On the Iowa Meteorite. By A. W. B.

Curiosities of the Key Board. By

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

March 9, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, or any patent issued since 1867, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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English Patents Issued to Americans.

From March 5 to March 9, 1880, inclusive.

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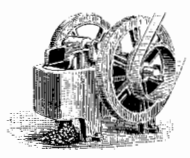

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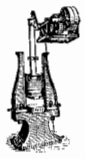

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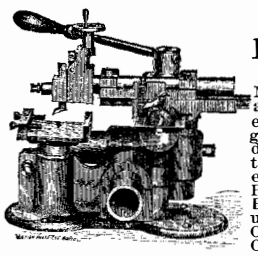

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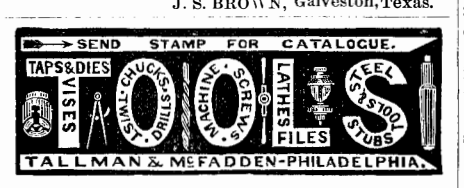

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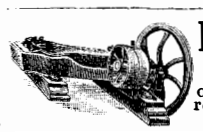

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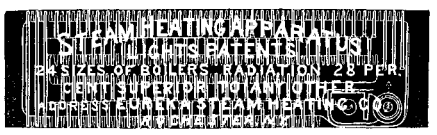

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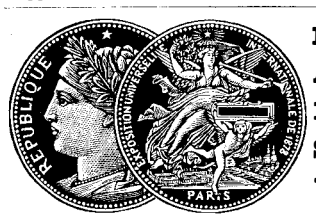

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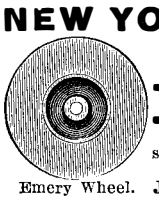

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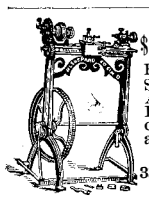

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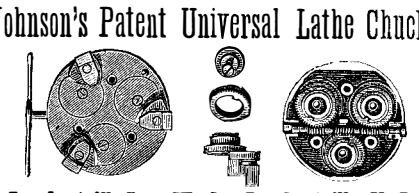

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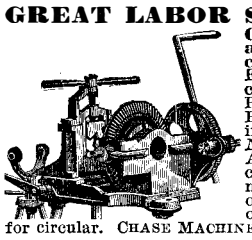

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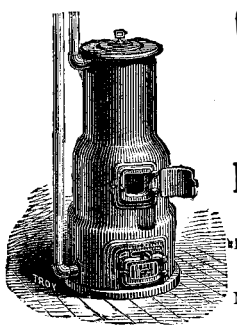

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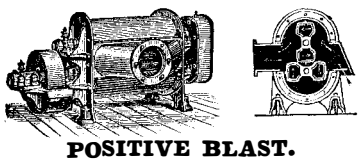

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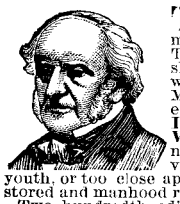

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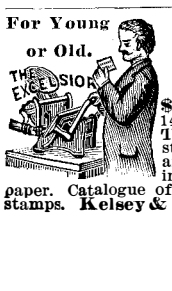

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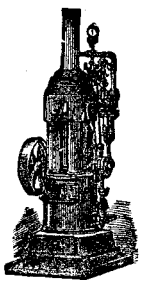

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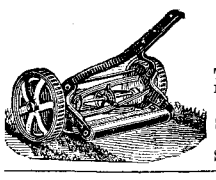

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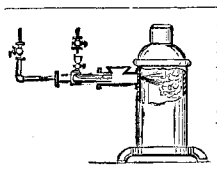

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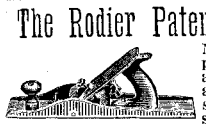

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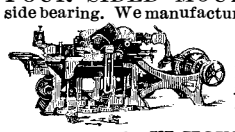

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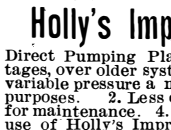

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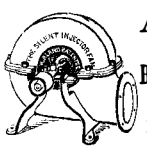

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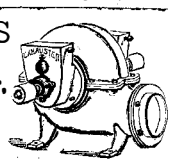

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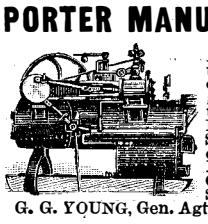

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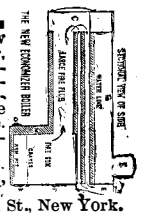

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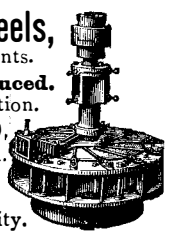

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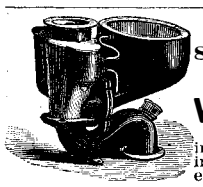

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